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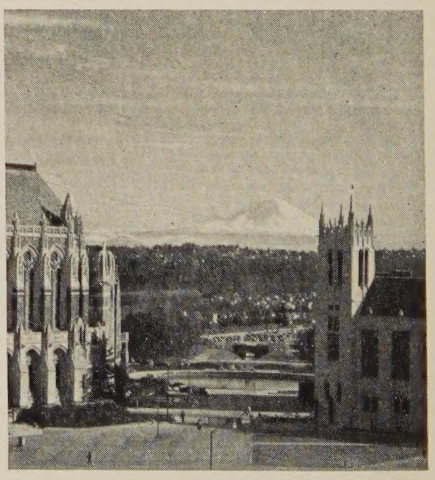
FAO — The Food and Agriculture Organization of the United Nations — grew out of a United Nations Conference held at Hot Springs, Virginia, U.S.A., in May 1943. The nations agreed to work together to secure a lasting peace through freedom from want. The Organization was formally founded at Quebec, Canada, in October 1945. It was located at Washington D.C. until 1951 when the Headquarters office was moved to Rome.

Unasylva is prepared by the Forestry and Forest Products Division, directed by Mr. Egon Glesinger, and published every quarter in English, French and Spanish. It attempts to cover a range of interest which is as wide as that of the Division whose work it mirrors. Signed articles express the opinions of the authors and do not necessarily represent the views of the Organization. All material in ***Unasylva*** may be freely reprinted, but acknowledgment is requested, together with a copy of the publication containing the reprint.



Cover photograph. *The Fifth World Forestry Congress was held on the campus of the University of Washington, Seattle. The campus looks over lake Washington toward Mount Rainier (14,410 feet, 4,400 m.) which looms majestically 50 miles (80 km.) away. Mount Rainier National Park includes the longest glacier in the United States (5 1/2 miles, 9 km.).*

Unasylva

An International Review of Forestry and Forest Products

FIFTH WORLD FORESTRY CONGRESS

One hundred years ago Seattle was a lumbering settlement. Now it is the thriving capital of a great state. Not far from the city one still sees forlorn ranks of great stumps of Douglas fir, reminders of the early profligate times. One can also visit nonstop sawmills where still again giant trees — fir, cedar, hemlock — are quickly cut up into an incredible amount of lumber but all the waste of the operation is put to profitable use. And around them a ring of private "tree farms," national forests, and great national parks.

Against this background was held in 1960 the Fifth World Forestry Congress, attended by 1,970 members. Over one third of these came from abroad, a striking tribute to the interest which American forestry commands in today's world. It was an outstanding gathering of the world's foresters and of all concerned with forestry in its many aspects. Sixty-five countries were officially represented and individuals attended from another six. Their presence is permanently commemorated by the International Friendship Grove which was planted in a colorful ceremony on the campus parkway of the University of Washington.

The purpose of the Congress was to provide an opportunity for free discussion and to reveal trends of thought about forestry problems of international importance which should be reflected in FAO's program of work. The pressure of formal papers and the range of specialized information which they covered limited discussion during the meetings themselves, but there were ample opportunities elsewhere for contacts and exchange of views. The object, therefore, was more than fulfilled.

The central theme of the Congress was the "Multiple Use of Forest and Associated Lands." Multiple use means the management of the forest in a manner that, while conserving the basic land resource, will yield a high level of production in the five major uses — wood, water, forage, recreation, and wildlife — for the benefit of the greatest number of people in the long run. This concept has passed into everyday usage in the United States of America, the host country for the Congress, as the way toward meeting the urgent wants and needs of a rapidly growing population in a dynamic economy.

The Congress concluded that the multiple-use concept presented new challenges and new opportunities to foresters everywhere, with great prospects for additional services to the welfare of mankind. It is not, however, a panacea to solve all forest management problems. Often one use must be dominant and other proposed uses must not then be detrimental to the major one. Moreover there can be disadvantages to multiple use when it is inefficiently applied. *But multiple use must be recognized as an important goal of forest policies.*

The Congress also reviewed in plenary session the progress made in forestry, region by region and in the widest sense of the term, since the last World Forestry Congress held in India in 1954. In an introductory address (reproduced in *Unasylva*, Volume 14, Number 3) the Director of FAO's Forestry and Forest Products Division said that there had been significant progress over recent years in all the various aspects of forestry and forest industries development throughout the world. But considering primarily wood production, the progress in the main had been, as with agriculture, in the already highly developed areas of North America, Europe, and in the Union of Soviet Socialist Republics. In the so-called underdeveloped parts of the world, production had not risen as was hoped. Indeed, the failure for output and consumption to rise in these areas, as should be warranted by population expansion, better living standards, and greater industrial needs, was the great disappointment of the last decade. *Needs would continue to grow, and governments must more readily take this into account in their forward planning.*

Before the members departed on tours to various parts of the United States and Canada, the Congress expressed its sincere appreciation to the people of Seattle and the state of Washington for the welcome and hospitality which had been enjoyed. To the Chief of the United States Forest Service, Richard E. McArdle, his Organizing Committee and to all who contributed to its work, the members extended the warmest congratulations on the signal success of the Congress.

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Technical Report of the Fifth World Forestry Congress

Silviculture and forest management

In the field of silviculture and forest management, the Congress considered inventories of forest resources, semi-arid and arid land forestry, modern concepts and advances in silviculture and forest management, and forest ecology and soils.

The Congress recommended *intensification of research in the adaptation of aerial photography to the peculiar problems of tropical inventories and in the development of more efficient techniques for collecting and analyzing the precise data required in intensive forest management.*

The need of developing co-ordinated inventory procedures in the measurement of multiple forest values was advanced.

The marked recent progress made in the application of machine processing of forest-survey data was noted, including the shift toward electronic computers which permit processing data within days, or hours, as compared with earlier much slower and more costly methods. Further research was recommended *to develop more efficient techniques for application to inventories of extensive forest areas and to varying levels of survey intensity.*

The discussion of semi-arid and arid land forestry revealed the difficult problems encountered in the integration of forestry and grazing, in the restoration of vegetative cover in regions subject to heavy grazing, and especially in the establishment of needed wood production forests for local populations. Views favoring the establishment and intensive management of forest areas on good soils were expressed. Such " forest tree orchards " are planned to produce a given product or products necessary in the region.

The improvement of the grass or tree cover on areas of poor land now supporting shrubby growth was also suggested. Tree planting on such areas should be considered after viewing the probable adverse water balance caused by tree vegetation.

In recognition of the pressing needs for forestry measures in many dry regions of the world, the Congress recognized the need for intensified studies of the diverse and difficult problems involved.

Figure 1. – *Gay with flags of all participating nations hanging from its horse-shoe shaped balcony and filled nearly to capacity, Meany Hall on the University of Washington campus, was the scene of the opening ceremonies of the Fifth World Forestry Congress.*

Courtesy: U.S. Forest Service

FIGURE 2. – *Egon Glesinger, left, Director of the Forestry and Forest Products Division, FAO, confers with B.R. Sen, Director-General of FAO.*

Courtesy: *The Timberman*

The topic of "forest tree orchards" versus "naturalistic" silviculture brought out differing opinions relative to how far foresters can safely depart from "natural" forest conditions. Studies should be made over a long period on the same site. Appropriate roles for both concepts in forest management were recognized. Foresters need to understand the biogeocenotic relations of the forest and apply silvicultural concepts and procedures based on the knowledge of natural laws. The traditional silvicultural methods can be consonant with multiple use.

In the planning and control of managed forests, attention was given to the most advanced procedures followed in Europe and North America, including the large-scale application of permanent sample plot systems as a method of inventory control. Discussions of the influence on silviculture of delivered prices of forest products explored present and expectable limitations on the intensity and costs of silvicultural treatment imposed by market factors. New methods in controlling stand composition were discussed, particularly those pertaining to control of undesired species.

In the field of forest ecology and soils, the Congress reviewed recent progress in classification and mapping of sites, intensive soil management for increased wood production, and the relation of tree diseases to soil management. Intensified research was recommended on *forest productivity rating systems*. The increasingly important role of soil improvement practices was recognized. The concept of the forest as a dynamic ecosystem received much support. The nutrient cycle and its modification through silvicultural practices were discussed. The importance of the ecosystem concept was stressed in reviewing progress on indirect estimation of forest site productivity from measurements of ecological factors. The significance of understanding the underlying relationships between site productivity and all of the factors of the ecosystem which influence it were recognized. Such knowledge permits prediction of the potential site for different species and provides a basis for estimates of the potential productivity of different forest regions of the world and their future role in meeting world needs for forest products.

The Congress recommended the following with respect to expansion of the forest typology activities of the International Union of Forest Research Organizations:

1. *That the working group program in forest typology of IUFRO be expanded* to include other methods of forest typology, the majority of which were discussed at the ecosystem symposium of the Ninth International Botanical Congress, in order to reach practical conclusions on how these methods can be made comparable and usable for forestry.
2. *That this working group present methods of evaluating the multiple uses of forest land* using combinations of forest, soil and climatic features which may be readily applied by practicing foresters.

Other recommendations adopted by the Congress were:

1. *Establishment by FAO of uniform procedures for recording and registering essential data on experimental forest plantations.*
2. *FAO should investigate the possibility of obtaining preferential rates for air transport of forest seeds and plant material intended for experimental use.*
3. *Promotion by FAO of a campaign of "Forests for the Year 2000" to assist in the reservation or creation of forests in countries where forestry is not well developed.*
4. *Governments should control goat grazing on forest lands.*
5. *Study should be made of the creation and treatment of forests of proper biogeocenotic condition in different countries.*
6. *Special research to be undertaken to make clear how far we may deviate from nature in our forest cultivation.*
7. *Studies in "forest tree orchards" should be undertaken to give guidance on how long-term repeated plantations on the same land can be made efficiently.*

GENETICS AND TREE IMPROVEMENT

The Congress reviewed progress in tree improvement and discussed proposals for international co-operation in genetics research and related activities. General agreement was reached on the need for strong co-operation in the exchange of breeding materials and in seed certification. Several alternatives were discussed which varied from a system of voluntary co-operation to a rigidly enforced international code endorsed by member nations.

The Congress recommended that *FAO take action to develop an international agreement to facilitate exchanges of breeding material, especially for experimental purposes.*

The Congress recognized the need for action to utilize fully forest tree improvement to strengthen afforestation and regeneration programs and to further the diverse objectives of multiple use. It, therefore, recommended that a *world-wide technical conference be organized by FAO, with the support and endorsement of the International Union of Forest Research Organisations and similar bodies*, to co-ordinate and promote at an early date the development of forest tree improvement techniques, the mass production of improved planting stocks, and the adaptation of such techniques and materials to afforestation and regeneration programs on a scientific and rational economic basis.

The Congress supported efforts to standardize the naming of plants and recommended, in the interest of international co-operation, *the use for forestry of the International Code of Nomenclature for Cultivated Plants.*

Delineation of the objectives of forest tree improvement and the discussion of attainment of these objectives brought out the importance to genetics of basic research in supporting sciences. The Congress recognized that tree improvement through selection, hybridization, through polyploidy and mutagenesis and influence of environmental factors offers exciting opportunities.

Forest protection

The Congress reviewed recent progress in reduction of losses from forest insects, diseases, and fire. There is a definite and direct relationship between weather and climatic variations and the occurrence of destructive insect and disease epidemics and disastrous fires, making it possible to predict dangerous periods and to plan for extra precautionary procedures. Progress was reported on the possibility of reducing lightning occurrence, a major cause of serious forest fires.

New approaches to improved chemical, biological, and cultural control of forest insects were discussed. The need was stressed for more basic information on the life histories of forest insects and other forest fauna, for more selective insecticides, and for more effective methods of application. The success of past explorations for and introductions of parasites and predators of forest insects has demonstrated the value of biological control, particularly for species introduced into North America. Continuing research on insect pathogens indicates the increasing usefulness of virus, fungus, and bacterial diseases for control of certain groups of forest insects. Some degree of protection from harmful forest insects can be secured by maintaining natural forest species mixtures, by removing susceptible trees, and by thinning or other cultural treatments to promote tree and stand vigor and to favor protective biotic agents. The most effective forest insect control can be obtained by integrating chemical, cultural, and biological practices.

The need for better knowledge of how to protect forests against fire is receiving increased attention because of the increase in world demand for forest products. One critical problem in meeting fire control objectives is to maintain flexibility in the fire fighting organization. It must be economical, yet capable of meeting critical emergencies. This is accomplished in Australia through a nucleus of fire fighting specialists augmented as needed by local residents and forest workers. Another way of meeting this need is through mechanization and the development of new and improved chemicals. Aircraft are now used widely in the United States and Canada both for quick movement of men and for direct fire attack. The Congress considered the role of research in the development of better fire control. Special needs for data on forest fire behavior were given recognition, and recent studies in this area were reported.

Catastrophic losses have been caused on all continents by diseases introduced from other continents. To prevent similar occurrences in the future, there is need for more information on the diseases of all continents, on how they may be recognized, on the susceptibility to them of important tree species of other continents, and for improved quarantine procedures.

Protective and eradicative toxicants long used in agriculture are now available for control of diseases in forest nurseries, plantations, and managed stands. They include organic fungicides, selective phytocides, soil fumigants, and systemic antibiotics. These chemicals offer a promising new approach to the direct control of forest disease. Root rots of forest trees may be characterized as " management diseases " because their occurrence is directly related to the intensity of forest management. Control may be secured either through changes in silvicultural practices or through special direct action programs.

The Congress strongly recommended that more *research should be undertaken to determine the fundamental factors responsible for pest outbreaks and catastrophic fires and to improve preventive and control measures.*

Forest economics and policy

Forest economics and policy discussions at the Congress dealt with subjects of broad general interest involving situations and problems common to most countries represented; namely, policy and economic problems in the conversion of old-growth stands to managed forests; significance of supply, demand, and marketing analysis in formulating forest policy; institutional arrangements for forestry; and how to achieve better management of small woodlands.

The discussion brought out that the problem underlying forestry advancement in most countries is basically one of inadequate local markets. In many areas of the world, particularly the so-called underdeveloped countries, timber for fuel is the principal local use, with the accessible old-growth being " creamed " for quality export material. Often these countries have a great wealth of timber, yet they import most of the timber, pulp, and other primary forest products they so desper-

ately need and could readily supply from their own resources. Indeed, forestry progress may languish unless substantial local markets for a variety of needed products are developed in these timber-rich countries. The heavy inroads made by competing materials is another major handicap.

Studies of supply, demand, and marketing of forest products are essential to forward planning in all countries in order that the necessary steps are taken to foster forest development and to satisfy the probable long-range timber requirements and to maintain wood and wood derived materials in a competitive market.

Private forests play an important role in the timber economy of many regions. Some countries have decided they cannot afford to leave the future of private forests solely to the devices of the owners unless the private landowner has accepted appropriate land proprietorship. Generally, large private owners do a good job of managing their timber holdings. But with the exception of certain regions this, unfortunately, is not the case with all small forest ownerships which hold a large percentage of forest land the world over. In a large part, these small forest holdings are owned by farmers and others not associated with any forest industry. Growing timber is not, generally, their main productive activity.

The Congress reviewed various approaches to getting better management applied to small forests. It strongly recommended that *the most acceptable approach entails such measures as intensive education and various forms of public support and assistance.*

Education

The problems and needs in forestry education for countries with newly developed forestry programs were examined in terms of the type and scope of institutions needed, and the manner in which public support for such institutions might be effectively achieved.

The great need for trained men at both the technical and professional levels, especially in tropical countries, was repeatedly emphasized. The Congress was greatly concerned about the capacity of existing schools to meet these demands.

Figure 3. – *Dr. Sen (center of the group) walking across the campus to attend the Congress opening ceremony.*

Countries should intensify their efforts to secure professional training for their most competent men. The Congress recognized that for some countries the best course may be to send their men to well-established forestry schools in other lands. However, the Congress recommended that *strong regional centers for education and research be set up in areas of emerging forestry activity, while ranger schools and similar institutions for training technicians should be the concern of each country.* The Congress recommended that *FAO and other appropriate agencies should consider favorably requests for assistance in financing and staffing for both types of institutions.* Further, that *all countries in these areas should set as an early goal the development of a strong nucleus of men trained at institutions with full university status.* Such a nucleus was deemed to be essential as a prerequisite to the establishment of ranger schools and professional schools within a country. Also, forestry must attain the prestige which only a highly competent, professionally trained cadre of men can give. Such prestige and respect are required in order to exert the necessary influence to elevate forestry to a high level in the eyes of people and their governments.

The Congress expressed the need for more professional foresters trained in the economic aspects of forestry. There was no question that scientific experts are essential to the development of modern technologies. But countries also have need for men capable of making broad appraisals of various economic factors that will influence decisions in the orderly, planned development of a forestry program. The Congress recommended that *special effort be made by international organizations and other agencies to train such men.*

The Congress also recognized the need for training more teachers capable of organizing and directing curricula in forestry education at all levels. It was also emphasized that in most cases it is inadvisable to attempt to train specialists in the undergraduate years. What is more important is to provide a solid foundation of basic sciences and forestry principles. Specialization can best be accomplished by graduate study. The sentiment of the Congress was that graduate schools should usually not be established in newly developing countries.

Existing schools with well-established faculties and facilities can absorb additional numbers of students. These, together with the new tropical educational and research centers recommended, can serve for the immediate future. As a special device to supplement advanced training, the Congress recommended that *FAO should organize and conduct regional seminars for exchange of information among foresters from ecologically similar regions.*

The Congress recommended that *some forestry schools or special institutions should give instruction in world forestry to prepare teachers and technologists to staff missions abroad sponsored by FAO and other agencies.*

The Congress recognized that advancement of forestry depends on broad public understanding and support. Substantial success has been achieved in enlisting support in a number of countries, using a variety of methods. The Congress recommended that *these methods be studied and adapted to local conditions by countries needing to strengthen their public education programs.*

Forest products

The role of forest products research in promoting the economy of undeveloped forest regions, in making forest supplies go further, and in making intensive silviculture practicable was emphasized in the diverse subject matter relating to forest products dealt with by the Congress.

The latest findings on the intimate structure of wood, as revealed by the electron microscope, and the relation of structure to physical and mechanical properties were considered. Progress in the chemical characterization of wood was reviewed, with emphasis on the characteristics of cellulose and lignin and their relationship to molecular structure, and on the diversification of products from chemical conversion. Included also were discussions on the importance of wood quality and factors that affect it; progress and automation in wood processing; the potential of integrated utilization; the significance of wood preservation and protection; and progress in the development of increased pulp yields and new pulp sources, especially in improved utilization from broadleaved trees.

The Congress, in recognizing the diverse contributions of research in forest products to improved utilization and its impact on forestry, viewed as a salutary factor the interest in establishing forest products research laboratories in additional countries. The Congress recommended *a widening of forest products research effort by governments, educational institutions, and private agencies.*

The multiple use concept of the forest has as a counterpart the diverse use of forest products. This, in turn, results from the great variation in species characteristics and a wide range of wood quality within species. The Congress recognized the importance and the potential of improvement in wood quality from the utilization standpoint through improved genetics and silviculture, which was a strong argument for continued and expanded research effort in this field.

The review of progress made in the efficiency of wood use through integrated utilization has reaffirmed the importance of that approach. The Congress recommended that *continued effort and co-operation among industries should be encouraged to further the potential of integrated utilization, and that research be continued to facilitate its further development.*

The substantial increase in the use of many forms of wood residues as a means of effecting more complete utilization was recognized by the Congress. It was emphasized that sawdust in its present form and shape presents perhaps the greatest problem in achieving satisfactory utilization. Research on the utilization of wood residues should be continued, and the Congress recommended that *increased effort be given to the redesign of saws that will afford longer fibered sawdust chips of more usable form, without adversely affecting the cutting rate and production costs.*

In the pulp and paper field, great progress has been made in recent years in appreciably increasing yields of certain pulps by the development of the semichemical, chemi-groundwood, and cold caustic soda processes, and research has shown the potential of broadening the species base by the pulping of hardwood species.

The Congress recognized the need for increasing pulp and paper utilization in many regions, and recommended increase in the research effort to improve pulping methods for broadleaved species, particularly mixed hardwoods, to meet the challenge for development of new pulp sources.

The Congress recognized the enormous drain on the forest resource and the reduction in serviceability of wood and wood products through decay organisms, and the importance of wood preservation and protection in decreasing this drain and in increasing the serviceable life of wood products by preservation. The Congress recommended that *every effort be made to disseminate available information on wood preservation and protection, and that vigorous research be continued to develop new toxic preservatives and improved methods of treatment that will assure adequate penetration with a minimum adverse effect on mechanical properties.*

The Congress took cognizance of the great increase in the production of fibreboards and particle boards throughout the world, and the significant effect of this development on improved utilization, particularly of wood residues. The Congress recognized that these developments have resulted from extensive research further to broaden the utilization of residues, develop improved products, and reduce costs.

The current research findings on the chemical composition of wood and its constituents re-emphasized the complicated nature of wood, the great variety of component derivatives that can be segregated, and the broad potential for chemical conversion of wood residues into diverse and useful products to increase the efficiency of wood utilization. The Congress recommended *the extension of basic chemical research to broaden the knowledge of the chemical constituents, particularly cellulose, hemicellulose, lignin, and extractives.*

The Congress recommended further that *plans should be made to arrange, at appropriate intervals, meetings of directors and other research leaders of the various government and other forest products research laboratories and organizations, to review research progress and to co-ordinate, as far as possible, their diverse research programs.*

Forest and range watersheds

The Congress dealt with four broad general subjects. During the discussion on protection forests, the participants were impressed by the similarity of problems

of avalanches, floods, and sedimentation as represented by reports from Japan, India, and the Alps. But it was also revealed from papers and discussions that there were considerable differences in the methods used to correct or alleviate torrential erosion, floods, and sedimentation in sectors around the Mediterranean. While forests play an important part in stabilizing soils and reducing flood runoff, it was demonstrated that in certain critical situations reforestation must be supplemented with structural measures such as contour terraces, channel barriers, levees, diversions, and similar devices.

The discussion on shelterbelts showed that such plantings have proved very effective in reducing wind erosion, evaporation, and damage to crops from blowing soil, and in ameliorating local climate. There appears to be some conflicting evidence as to the most effective pattern and design of shelterbelts. It was pointed out that the most effective design as found from long experience varies greatly from one locality to another.

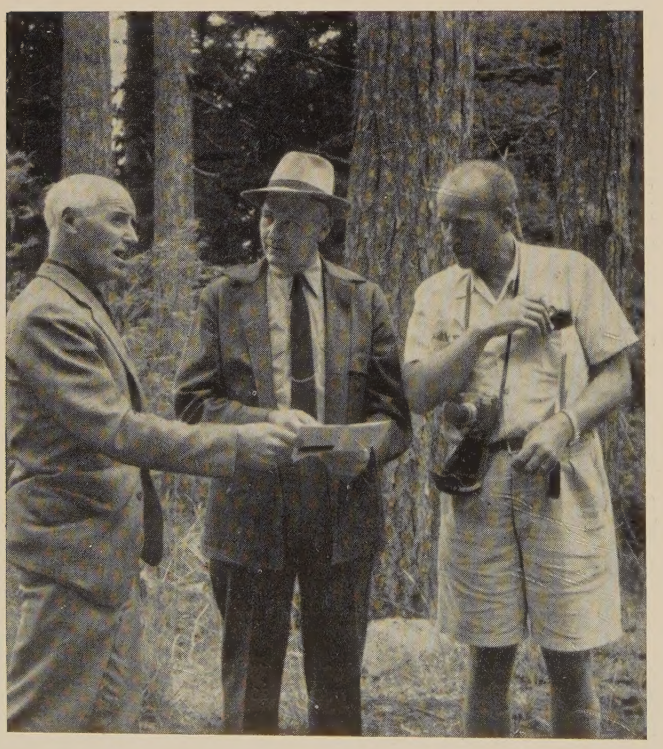
The session on management for water production produced much interesting discussion as to the effect of forests on water yield and streamflow regimen. The character and condition of the forest plays an important part in influencing the amount and timing of water flow. Where a particular watershed constitutes the primary source of water for a municipality, special management techniques and objectives may be required, and in some situations multiple use should be approached with care to avoid damage to water quality. The amount and timing of water yields may be appreciably altered by changes in density, pattern, or composition of the vegetative cover.

Such activities as logging and grazing must be carried out with due consideration of their possible effects upon storm runoff and erosion. On steep unstable mountain areas, special measures to remove logs, such as overhead cables, may be required to prevent excessive soil disturbance. Grazing should be guided by proper distribution of animals, a system and timing of use so as to maintain a good cover of desirable forage species.

The Congress recommended that *the primary division for land use planning purposes should be one that best promotes water conservation, water control, and local climate modification; this would indicate the watershed, drainage basin, or catchment as the most desirable planning unit.* It was again recommended, as had been done by previous World Forestry Congresses, that *foresters should actively participate in all such planning activities.*

FIGURE 4. – *Rex Wakefield, center, of the Siuslaw National Forest, Corvallis, explains watershed management. With him are Sir Henry Beresford-Peirse (left), Deputy Director, FAO Forestry and Forest Products Division, and F. Harald Ebeling, Sweden.*

Courtesy: *The Timberman*



FOREST RECREATION AND WILDLIFE

The Fifth World Forestry Congress was the first to include the subject of recreation and wildlife on its agenda. The decision to do so rounded out the consideration of the multiple use of forest lands. In view of the keen interest shown on this subject, the hope was expressed that this topic would be a feature also of future congresses.

The subject of forest recreation and wildlife was developed in three sessions, emphasizing recreation, wildlife and reserves, respectively. Although each session was complete in itself, there were common elements that applied to the others.

The public use of forest areas for recreation is expanding at an unexpected rate in many countries. Although regarded as a desirable form of public enjoyment of the outdoor values of forests, the increased numbers of people in the forests has emphasized several management problems. These include such matters as fire, damage to flora, and how to manage great numbers of people.

Some nations are faced with the problem of overuse of national parks by people, whereas in some other regions the need is to establish parks and place them under administration. Discussions brought out that the primary reasons for parks and reserves will vary with the special values to be safeguarded. In much of Africa at the present time, attention is focused on reserves for wildlife. In several places in the world, the desirability of international parks and reserves on the boundaries of neighboring countries was mentioned.

A number of countries, notably in Western Europe, have nature protection laws that set the national policy and program. Some of these laws provide for zoning of private lands to maintain a pleasing landscape.

Forest wildlife was recognized as an integral part of the forest. Papers and discussions brought out that

FIGURE 5. – *The Emmons glacier, at the center of Mount Rainier National Park, was visited by delegates during one of the Congress tours. Mount Rainier is one of the chain of massive extinct volcanoes that circles the Pacific Ocean, of which perhaps the best known is Mount Fujiyama in Japan.*

Courtesy: A. Métro

from a recreational and ecological point of view, all animals may be of importance. It was pointed out that many animals are far from neutral elements of the forest complex, since big game, rodents and seed-eating birds may interfere with forest regeneration. The management directives on forest game animals differ from place to place, and while there are, on the one hand, forest areas in both hemispheres where increased harvest of game animals is warranted, there are others where total disappearance of some species of wildlife over large tracts can only be averted by careful conservation.

The Congress made the following recommendations:

1. *Forest recreation and managed wildlife should be recognized by governments as acceptable forms of multiple use management of forest lands.*
2. *Since all forms of animal life affect or are affected by the forest, understanding of their roles in the forest should be made more widespread.*
3. *Research in forest recreation and wildlife should be provided to furnish additional information to cope with the growing problem of public use, site damage and wildlife management.*
4. *Public information media should be used to encourage the appreciation and protection of outdoor values, and the understanding that wildlife may need to be utilized in some areas and protected in others.*
5. *International co-operation should be established in the preservation of nature and wildlife reserves in contiguous border areas.*
6. *To assist in new programs of reserves and wildlife management, technical assistance should be made available to the new nations of Africa and to other nations through international agencies.*

LOGGING AND FOREST OPERATIONS

Many aspects of planning and management of operations for a wide range of size of enterprise in many forest regions were discussed by the Congress. While it was quite evident that the methods of one region can seldom be successfully transposed to other regions with differing forest, social, and economic conditions, the exchange of experiences on how operating problems have been solved for various specific conditions does develop basic principles which are helpful to those concerned with management of operations of every size in any country. The necessity in every circumstance for advance planning, based on an adequate inventory of timber resources, of the expected costs and returns of the operation, and the silvicultural and protection requirements to maintain a high rate of productivity for the forest property was a common theme of the discussions on various phases of logging, logging road construction, and use of cableways in every part of the globe.

The Congress was deeply concerned with the recruitment, training, safety, and welfare of forest workers. The numerous factors which make for more and greater obstacles to social progress in forestry than in most other industries were developed, but the evident consensus was that foresters are responsible for the social progress of forest workers.

The development of working techniques and the training of forest workers through the co-ordinated efforts of the Food and Agriculture Organization's European Forestry Commission, the United Nations Economic Commission for Europe, and the International Labour Organisation were discussed at some length. The sentiment of the Congress was that the accomplish-

ments of the joint committee fostered by these three agencies has been excellent and that this type of activity should be intensified and expanded to other forest regions, particularly in underdeveloped countries.

The Congress recognized that training and safety are so closely related as to be virtually inseparable for systematic consideration. Accordingly, the Congress, recognizing that forestry work, including the various phases of timber extraction, ranks among the most hazardous of occupations, recommended:

1. *Greater efforts on the part of governments, employers' organizations, and workers' groups in the prevention of accidents.*

2. *Activities connected with safety programs now in operation in the various countries and the work in this field at the international level should be continued and expanded, particularly in the exchange of experience between countries on the human factor, safety instructions in vocational training, forest accident statistics, and safety equipment.*

The Congress also recommended that *international training courses, fellowships for personnel desiring to study abroad, publications on training, manuals on work techniques and equipment, development of testing procedures for forest machinery, and encouragement of research in improvement of work efficiency should also be continued and expanded, and that appropriate international organizations give attention to co-ordination of such matters.*

Tropical forestry

In regard to tropical forestry the Congress considered four major topics: regeneration and establishment, obstacles, intensive versus extensive management, and shifting agriculture.

Natural regeneration and planting were the subjects of spirited discussion in which the views of the delegates reflected the abundance or lack of forest resources in the areas with which they were most familiar. It was recognized that both types of regeneration are needed in many areas and that they are not mutually exclusive.

A somewhat gloomy picture of declining resources, lack of responsible management of large areas of lands, and high production costs was described. This picture, apparently not accepted as realistic by all present, prompted discussion from the floor describing forestry progress in several areas as a partially counteracting development.

It was concluded that the most satisfactory system of forest land tenure in many developing countries is a combination of government control and the delegation to private interests over long-term periods of some or most of the responsibilities of ownership. In forest concessions, it was suggested that the major yield control decisions should remain the responsibilities of the state, that royalties be revisable in accordance with the changing volume of money, and that the concession be conditional upon the establishment of a manufacturing plant of appropriate capacity which cannot be disposed of separately from the concession itself.

In considering intensive versus extensive tropical forest management, it was apparent that policies should be influenced by a number of factors, some of which are only indirectly related to the timber resource itself or the need therefor.

Shifting cultivation was highlighted as a serious threat to remaining forests in many parts of the tropics. Whereas it was accepted that under some circumstances the practice may not be entirely destructive, the problem of saving tropical forests from encroachment by the shifting cultivator was seen as a tropical forestry problem of the first order. Techniques described to meet this problem were local in their applicability. It was agreed that intensive permanent agriculture must replace shifting cultivation, not only as a better land use but also to meet more satisfactorily the crop requirements of growing populations. The foresters' task in the meantime is seen as a combination of the following:

1. obtain reservation of areas of forest lands where possible;
2. increase the productivity of forest lands;
3. develop more effective forestry practices compatible with shifting cultivation and adapted to the character of lands abandoned by the shifting cultivator.

The Congress therefore recommended that:

1. *Governments take immediate steps to identify those areas within their national boundaries which should remain forested and to this end seek the assistance of international or bilateral agencies.*

2. *Countries faced with serious problems of shifting cultivation and deforestation should seek financial and technical assistance from appropriate United Nations and other organizations.*

3. *Permanent working groups be set up, possibly in the Regional Forestry Commissions of FAO, for the world-wide study of the problem of shifting cultivation and with the responsibility to report progress to the next World Forestry Congress.*

The Concept of Multiple Use of Forest and Associated Lands - Its Values and Limitations

Richard E. McArdle
Chief, Forest Service, United States Department of Agriculture

It is a great honor to address this first general session of the Fifth World Forestry Congress. My subject is the same as the theme of the Congress — the multiple use of forest lands. This theme is an appropriate sequel to the Fourth World Forestry Congress at Dehra Dun in 1954. There the theme was the role of forested areas in the land economy and economic development of a country.

In reporting on the Fourth World Forestry Congress, FAO said: "There are few countries in which production in the forest is limited to timber alone. It is in fact by no means certain that specialized single-purpose land use, particularly on a permanent basis, is ideal. In some social and economic environments, such specialization would certainly not help toward reaching the desired goal of deriving the maximum yield from the land for the benefit of the community as a whole. This the Congress implicitly recognized by accepting the principle of 'multiple use' of the forest."

Multiple use is a familiar term to foresters of the United States. Its meaning was symbolized on this stage in the opening pageant yesterday. Pictured were the five major uses of forest land — for wood production, use as watersheds, grazing by domestic livestock, the forest as habitat for wild game and fish, and use of the forest for outdoor recreation.

Although "multiple use" may not be a customary term everywhere, the practice of multiple use has been long established in some intensively managed forests of other countries. Later in this Congress you will hear papers reviewing multiple use here and in other countries and in various kinds of ownerships. Some of the Congress tours will enable you to observe the practice of multiple use on forest lands in the United States.

As FAO noted, management of land to serve as many uses as possible is everywhere becoming more essential. When there is abundance of natural resources and few people, there is little need for multiple purpose land use. But when increasingly large numbers of people must rely on an unchanging or diminishing resource base, they must make the most effective use of the resources they have. Multiple use of renewable land resources thus is a necessity born of scarcity of resources and abundance of people who need these resources.

Competition for the use of land is growing throughout the world. This competition will not decrease but will increase as world population increases. World population is now about 3,000 million persons. It has increased as much in the last two decades as was the total growth of population up to the year 1750. In 1800, my own country had 5 million people. One hundred years later we had 76 million. In the next 50 years, our population doubled. The census now being made in the United States indicates an increase in our population from 5 million to 180 million people in 160 years. And United States population is expected almost to double again by the end of this century.

It will not surprise you who come from older countries to hear that in the United States of America we are now feeling the impact of a dynamic population growth on a static land base. Older countries already have had this experience. A few countries represented here today still have abundant natural resources, more than adequate for their present populations. Inevitably, however, as their populations increase, their need for resources will increase, and competition for the use of land in those countries will become more intense.

As the people of the world become city dwellers, they tend to lose sight of their dependence on natural resources. Most of these are products of the land. My forefathers and yours lived close to the land. They knew their dependence on the land for food, for clothing, for shelter, and for fuel to warm the shelter.

To these basic necessities of life we must add today our dependence on natural resources for all the raw materials of industry. The history of mankind is the history of man's competition for land, of man's struggle to obtain adequate natural resources — and of man's overutilization of resources.

I realize that these are facts well known to this audience. Foresters are trained to take a long look ahead. We also are required to live close to the land. Thus we understand the dependence of people on natural resources produced by the land. We are aware, too, that our stewardship of a large part of the earth's surface imposes upon us great responsibility to obtain full productivity of these lands for the benefit of our fellow men, whom we serve. This is why we, the foresters of many nations, propose to dedicate our discussions at this Congress to sharing our knowledge and experience so that we may improve policies and practices relating to wise use of forest lands.

The wise use of forest lands, however, cannot be considered in a vacuum. It must be considered in relationship to the fullest possible yield of all the products and services that forest land provides for people.

Keynote address delivered at the Fifth World Forestry Congress.

In past years many of us have thought that we had enough land in forest in the United States of America to meet all foreseeable needs for wood and other products and services of forest lands. Today we are not so sure. We think our earlier estimates were too conservative. We are now genuinely concerned. Much forest land is being taken for other uses. Competition for land is becoming intense in the United States.

For example, wherever you may travel in this country you will see great expansion of urban areas. This is taking land which heretofore was included in our estimates of available forest area.

Superhighways, new airports, transmission lines for electrical power, oil, and natural gas, and construction of dams and reservoirs are taking many millions of acres of forest land. Forest land will continue to be taken for national defense purposes.

Large pressures are developing to set aside additional forest lands exclusively for recreational use. Conversion of land from forest to food production, inevitable in the next few decades, will include substantial portions of our most productive forest land.

The diversion of forest lands to other purposes could, in another 40 years, total about one fourth of the present United States commercial forest land area, equivalent to one third of our timber-growing capacity.

I do not condemn single use, primary use, one-purpose use, or exclusive use of land for one major purpose by whatever name may be applied. Some of these individual uses are as essential for the benefit of people as is the use of forest land for multiple purposes. For some purposes, superhighways, for example, the land obviously must be devoted exclusively to that use. There is nothing we can do to make such land serve more than that one purpose.

The consequences, however, of large-scale diversion of forest land to single-use purposes are now so serious in the United States as to justify careful consideration. Every acre of forest land diverted to nonforest use adds to the lands remaining in forest an additional burden of productivity. By the end of this century, a short 40 years away, need for wood in the United States of America will be double our requirements today. We shall be hard pressed to meet future wood requirements even if no more of our present forest land is diverted to other uses.

In addition to meeting greatly expanded requirements for wood production, forest land management in the United States faces greatly increased demands for the other products and services which forests provide. For example, exclusive of Alaska, more than one half of all the water of the western United States originates on the national forests, although these publicly-owned forests comprise only one fifth of the total area in this part of our country. Maintenance of a forest cover on this land protects water quality. Protection alone, however, will not produce the large increases in quantity of water needed by greatly increased numbers of people, by agriculture, and by industry. These requirements have doubled in the last 20 years and are expected to double again in another 18 years. To increase water yield, manipulation of the forest cover is essential. If your tours take you to some of our experimental forests, you will see how the methods used in timber harvesting can serve also to increase water yield.

Many coniferous United States forests and intermingled grasslands are used for grazing of domestic livestock. In this country, as in yours, forests also provide the habitat for many kinds of wild game. These uses are increasing.

Recreational use of national forests has tripled in the past 12 years.

Use of forest land for these several purposes is nothing new. In every country and for centuries forest land has been so used.

What is new is the rapidly growing awareness of the need to apply multiple-use management more widely and more intensively. This comes not only from the obvious need to make forest lands more fully useful to the people but also to lessen the pressures to divert forest lands from a combination of uses to some one exclusive use. In most instances, forest land is not fully serving the people if it is used exclusively for a purpose which could also be achieved in combination with several other uses.

Multiple use of forest lands in the United States did not spring into full flower overnight. While the term has become commonplace only in the last two decades, the practice of multiple use in the United States goes back to the origin of the national forests, more than half a century ago. National forest policies from the very first have emphasized resource use. The first Forest Service manual, significantly termed the "use book," recognized a multiplicity of uses. Even before this, the Forest Service had been instructed by the Secretary of Agriculture that national forest land was to be devoted to its most productive use for the permanent good of the whole people, that all of the resources were for use, and that decisions would always be made from the standpoint of the greatest good of the greatest number in the long run. These instructions have constituted Forest Service doctrine from the beginning. They are the genesis of multiple use.

Full recognition of the multiple-use principle of land management was given by the Congress of the United States about two months ago. The Act of 12 June 1960 directs that the renewable resources of the federally owned national forests, some 181 million acres, shall be managed for sustained yield and multiple use. General legislative authority to manage these public properties for use of their watershed, timber, forage, outdoor recreation and wildlife and fish resources was provided many years ago. The significance of the recent legislative enactment is, first, legislative recognition of multiple-use and sustained-yield principles of management; second, a clear-cut directive to apply these principles on the national forests; and third, naming the basic renewable resources for which the national forests are established and administered and assuring them equal priority under law.

Although this law applies to only one class of publicly owned lands, the principles involved have wider application. On the federally owned national forests the objective is to meet the needs of all the people. On state lands, the objective would be to best meet the needs of the citizens of that state. On privately owned lands the objective would be to best meet the needs of the owner. He would express those needs in whatever terms he might choose. These private owner criteria usually tend to be economic ones.

The Act spells out definitions of multiple use and sustained yield as these principles are to be applied to the national forests. Since the general objective is to manage these lands so that they best meet the needs of the American people, the Act and the accompanying legislative reports require that the five basic renewable resources shall be utilized in the combination that will best serve the people. Emphasis is on utilization, not preservation.

The legislative definition requires that management decisions be based on the relative values of the various resources and not necessarily on economic factors only. Intangible values which are difficult to express accurately in monetary terms also are to be considered. The definition does not require maximum production for all resources or for any one resource.

The legislative history of this Act directs that in making application of the principle of multiple use to a specific area equal consideration is to be given all of the various renewable resource uses, but this does not mean using every acre for all of the various uses. Some areas will be managed for less than all uses, but multiple-use management requires that there be more than two uses.

An essential of multiple use is positive, affirmative management of the several uses involved. Haphazard occurrence of these uses on some particular tract of land does not constitute multiple-use management. Multiple use is not a passive practice. On the contrary, it is the deliberate and carefully planned integration of various uses so that these will interfere with each other as little as possible and will supplement each other as much as possible. Multiple use is by no means an assemblage of single uses. It requires conscious, co-ordinated management of the various renewable resources, each with the other, without impairment of the productivity of the land.

Multiple use must be over a period long enough to experience the cycle of the seasons, that is, a year or more. It does not require that all uses involved be practiced simultaneously at the same instant.

Size of area is a key factor in multiple-use management. Application must be to areas large enough to give sufficient latitude for periodic adjustments in use to conform to changing needs and conditions. On the national forests, we normally think in terms of our smallest administrative units, which at present average about 200,000 acres. On large private holdings similar acreages might be applicable, but for small private ownerships the unit areas would, of course, be much smaller. They might be as small as 40 acres.

Multiple-use management of the renewable surface resources obviously requires control of all uses on the same land by one authority. Such management is not possible if several co-ordinate authorities are each trying to direct different uses on the same land. Central decision making is a prerequisite.

In brief, multiple-use management as we practice it on the national forests requires us to consider all of the five basic renewable resources, although on any specific area we may not have all of them in operation at any one time. It obliges us to co-ordinate these various uses even though doing this results in less than fullest possible productivity of some uses. The requirement for sustained yield applies to all renewable resources and is aimed both at getting a high level of productivity and at preventing over-use of any resource or impairment of productivity of the land.

Multiple use is not a panacea. It has limitations, but it also has overriding advantages. I am convinced of the distinct advantages of applying multiple-use management to the great bulk of our forest land.

First of all, multiple use helps to overcome problems of scarcity. It tends to reduce or resolve conflicts of interest and competition for resources. It promotes balance in resource use. It impedes the ascendancy of single-interest pressures. Properly applied, multiple use involves consideration of both esthetic and economic criteria in arriving at management decisions. It offers balance between materialistic and nonmaterialistic values.

Multiple use properly understood and properly applied is now, and will continue to be, the best management for most of the publicly owned forest lands of the United States. It will gradually become the best management for many of the large private holdings. It will always have less applicability to smaller private properties, but many of these owners will in time find it to their own best interest to practice some degree of multiple use.

Finally, the overwhelming advantage of multiple use is that through it foresters can make forest lands contribute their utmost to society. The basic purpose of forest conservation is a social one to satisfy the intangible as well as the materialistic needs of people. In this way, I believe foresters can make a major contribution to human betterment and perhaps even to world peace.

And now a closing word to you as eminent leaders in a respected profession. Multiple-use forest management is a challenge to foresters to broaden their vision. We must be forest land managers instead of primarily timber growers. The thinking of foresters is believed to be preoccupied with timber and dominated by silviculture. To some extent this criticism is justified. But multiple use, when properly applied, eliminates this bias. The future success of foresters and the contribution of the forestry profession to the welfare of our countries may depend on our response to the need for a balanced use of forest land resources. May we now and always perform in the best interests of the countries we serve.

Postgraduate Study for World Forestry

Svend O. Heiberg
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Only a few hours' drive from this campus, at Fort Vancouver on the Columbia River, David Douglas, the Scottish botanist, landed in 1825. Little did he anticipate that the magnificent Douglas fir, with which his name was to be associated, would become the most cherished exotic forest tree among European foresters. Neither did he realize that the particular ecotype he brought back to Kew Gardens in England would turn out to be the most successful of all the seed sources that later were imported to Europe for propagation.

This took place only nine years after the first academic forestry school in the world was established. For it was at Tharandt, Germany, in 1816, that Heinrich Cotta's master school was elevated to Royal Saxonian Forest Academy. Thus, in 1816, the first school offering college-level forestry education was brought into existence.

At that time, little could Cotta anticipate that today, only one or two rotations later, 10,000 students would be enrolled in forestry schools throughout the world. In Douglas' and Cotta's time, this university campus, indeed the entire vast metropolis of modern Seattle, was covered by a towering virgin forest that most likely had never been beheld by white man.

Like Douglas and Cotta, both pioneers but in different fields of forestry, today's generation must develop men whose work and vision can be of far-reaching and lasting importance.

In spite of the short span of time — in a forestry sense, only one or two rotations since the time of Douglas and Cotta — we live today in a vastly different world. Perhaps the most difficult thing in our time is to predict... yes, even believe in the future. In contrast, Douglas, Cotta and the generations following the Napoleonic wars and the Congress of Vienna could look forward with confidence to a period of development in science, education, technology, trade and increasing world population. And even more important, to a period of greater human freedom and appreciation of human dignity and rights.

Our youth of today, on the other hand, looks with uncertainty and fear into the atomic age with its threats of destruction of humanity and of our cultural heritage.

For years, many have realized the need for world co-operation and that our responsibility toward humanity is on a par with our responsibility to race, nation or tribe. Today, this need for co-operation is not only a means for making a better world to live in. It appears crystal clear that understanding and co-operation are necessary for our very existence.

We need leaders in every walk of life who can look beyond the needs of tribe, nation and race and regard the welfare of the world as our objective. How can we in education, and those of us in the field of forestry education, help to develop these types of men?

Mass education problems

One strong trend in almost every place of education throughout the world during the larger share of this century has been a strong emphasis toward mass education on all levels. This has also been the trend in forestry education. The chosen few who enrolled in Cotta's academy are a far cry from the more than 10,000 students who today are enrolled in academic forestry courses throughout the world.

This increase is not only an expression of the tremendous growth of our profession during the past 150 years, but is also an expression of the fact that our profession is sharing in the general expansion of education. We believe that the most valuable resource we have is knowledge. The more we share this knowledge, the better world we shall have.

This democratic thesis is accepted in most countries. But, in adjusting our educational machinery to meet the demands that such a philosophy brings about, we are likely to hamper the educational development of the better students. The educational freedom that is so highly treasured in many European universities is likely to suffer under mass education. In addition, the tutoring system that is so successfully developed in several British and American colleges does not lend itself readily to the education of large numbers.

Important as education for all is to society, it is equally important that the education of the most talented does not suffer. There is a tremendous need for leaders in most branches of endeavor, including forestry. In our effort to open wide the doors of learning to the many, we must not neglect to develop the talents of the gifted.

It is outside the scope of this paper to discuss how this objective in part may be met in early schooling and basic college training. For this reason, I shall confine myself to the opportunities that postgraduate — often called graduate — training offers.

The curriculum that the academic forestry schools throughout the world offer can, I believe, be charac-

Paper delivered at the Fifth World Forestry Congress.

terized as being crowded with technical courses aimed at qualifying the students for certain positions within the country in which the school is located. Little room is allowed in the curriculum for general education that would broaden the outlook of the students and give them a better perspective of forests and forestry in relation to our culture.

The need for general education courses may not be so acute if the preforestry schooling includes a thorough cultural curriculum or where the forestry school is a part of a university which can provide the many cultural advantages universities offer. This last idea presupposes that forestry students are given the opportunity and are encouraged to participate in the intellectual and cultural life of the academic community.

Another thing that is often characteristic of forestry undergraduate curricula is the lack of an appreciation of the value of research. Forestry is an art, and the *how* of forestry is often emphasized more than the *why*. Sometimes higher forestry education has even been accused of resembling vocational training more than academic education.

Finally, it may be said that much forestry education gives the impression of being "provincial." The students are given a training that is narrowly directed to meet the needs of their country or, quite often, the part of the country in which the school is located.

This accusation of a tending toward vocational training may be tied to the empirical basis for several of the most important disciplines of forestry rather than an experimental foundation, such as we are beginning to build now.

Variations in world forestry practices

It is striking how differently forestry practices are executed in different parts of the world. This is in sharp contrast to other professions, like engineering, medicine and architecture. For example, take the building of a modern bridge. Today a modern bridge is built almost in identical manner, whether it is built in Africa, Europe or America. Medical treatments are virtually the same, wherever modern medicine is available. Yet, not long ago, when local medicine men or folk medicine prevailed, treatments for human ailments varied widely throughout the world. Even modern architecture is adopting common basic principles. Modern houses in Japan, America and Scandinavia are remarkably uniform in concepts of design while great allowances are made to satisfy local taste and tradition.

You would agree, I am sure, that forestry is not that far. Many concepts basic to forestry are interpreted differently under similar conditions. Forest stands located under identical climatic, biological and economic conditions are often treated with great variations. Concepts of stand density and optimum growing stock for given situations are applied at great variance under equal conditions. It is, of course, only natural that concepts and implementation of public responsibility toward the forest resource should vary greatly under different political systems and resource-management traditions. But, when only technical factors are involved, then we should expect that the most logical concept would be accepted and applied.

Necessity for international training

The fact that we do not find general acceptance of concepts in forestry, I believe, reflects, in part, lack of international intercourse in our profession and, in part, lack of sufficient advanced training of our most gifted forestry students, that is, students who are equipped to take advantage of postgraduate studies on an international basis.

The demand for such international training in forestry exists today. To illustrate this, I refer to just one institution, the forestry college in Syracuse, New York, where I serve. Here, we had 45 foreign students during the past academic year. This was 33 percent of the total number of our postgraduate students. Similar situations more than likely exist in other schools. This leads to a basic question: How should such postgraduate studies in world forestry be planned and organized?

In contrast to the undergraduate, the postgraduate student should be offered far more freedom in selecting courses to meet his individual needs. This flexibility in setting up a graduate program may be difficult to attain when a student comes from a foreign country and is unfamiliar with the offerings of the new institution and local customs. Under these conditions it becomes difficult for his adviser to help plan the best possible program for him. Even evaluation of his past academic attainments offers many obstacles.

We must also recognize that the high school curricula that furnish the basic tools for later scholarship vary greatly from country to country. Not only do the curricula vary in content and quality, but also the length of time for high school study may vary as much as 25 percent.

We know that the professional forestry curricula offered in the forestry schools of various countries include great differences — far greater differences than we find within the professional engineering and medical curricula throughout the world. Part of these differences can be explained by the types of forests and terrain that characterize a particular country. In Switzerland, forest engineering is an important and necessary part of the forestry curriculum. In Finland, the management of swamp forest is listed as an option. Countries whose forestry is fully on a reproductive basis place great emphasis on silviculture. Countries that are in the transitional stage from extractive to reproductive forestry place relatively more emphasis on utilization and relatively less on silviculture and its underlying sciences.

To some extent, these differences may be attributed to the already-mentioned vocational flavor that can be found in forestry education. However, the more we dig down to basic principles, the more we shall discover how much we have in common.

It seems to me that the time is ripe for organizing special international conferences on forestry curricula. This would be of great benefit to our profession.

Program planning for postgraduates

At the present time, program planning for the postgraduate studies of international students in forestry is difficult and requires considerable understanding on the part of the adviser. He must not only know what courses and research possibilities are available, but he should also be able to appreciate the variety of backgrounds represented by the students in such a cosmopolitan group.

Fortunately, the students of world forestry are themselves usually relatively mature and have specific objectives in mind. They are of the elite of their school or professional group. In the ideal situations, the students are able to formulate their own program, outline their research problem, and even select their own advisors. This represents the *ideal* for postgraduate work: the least possible direction on the part of the adviser, and the most possible initiative on the part of the student. This is the way it should be.

Ideally, the student should perform and be considered as a young colleague of the professor in their common search for truth. We all are aware of the fact that this ideal is not the rule. Students look for directions, and actually prefer this, in many cases, to taking initiative and responsibility upon themselves. And professors soon discover that it is easier to direct rather than to advise. Indeed, graduate students are sometimes regarded and treated only as assistants. Under such conditions, the student is apt to find that his own research, training, and educational development is slowed up considerably.

Aside from educational standards and requirements inherent to securing a specific degree, the world forestry graduate student should be given as much freedom of study opportunity as possible so that his particular needs can adequately be met. Such freedom should not only include selection of recognized forestry courses but also the selection of courses far afield from what generally is considered to be part of a forester's curriculum.

Many students come to do graduate study to deepen their knowledge of a particular narrow speciality and to investigate a problem of their choice. Such students will stick primarily to courses closely connected with their specialization and, as a rule, most of their time will be spent on research, with only little time on regular courses. The final goal of these students in their formal educational endeavor is usually a Ph. D. degree.

But there is a second group of students who have broader interests. They prepare themselves to become responsible in a broader professional field. They expect to deal with people both inside and outside the profession. Eventually, they may have to become the interpreters and advisors on forestry to leaders of their community or country. They may include advice on legislation which has a bearing on forestry.

Such students may want courses in sociology, human relations, history, basic law or citizenship in addition to advanced forestry courses. They will want to develop themselves not only as foresters, but also as broad understanding human personalities who have a deep appreciation of the needs of our civilization. We must have leaders within our own profession who can develop, present and sometimes defend the place of forestry in society.

A third group of students that may be found within a postgraduate program in world forestry include, in particular, those students who want to prepare themselves to participate in the forestry assistance work that at present is sponsored by the United Nations and individual countries. Such students will want, in addition to their specialties, to study the economics of world forestry, and to study plant geography on a worldwide scale. They may want to participate in one of several programs in international living. They may take courses like the course in "overseamanship" developed by the Maxwell Graduate School of Citizenship and Public Affairs at Syracuse University, to mention one of the pioneers in this field.

It is doubtful that the technical courses for world forestry students should aim at application to any great extent. Principles should be the main objective. Applications are most useful, however, to illustrate principles. But principles in forest ecology, silviculture, forest economics, forest management, wood technology, wildlife management, forest recreation, watershed management, etc., are universal. Applications are legion and must be studied locally.

Teaching methods - and teachers

One of the most fruitful media for teaching such heterogeneous groups that will be found in a world forestry program is the seminar. In its orthodox form — a teacher working with a group of students doing research — excellent results can be obtained. Seminars lend themselves better than any other form of teaching device to stimulate active student participation. Each member of the seminar does research and reports on one phase of a common problem, the entire group discusses each student report and the problem as a whole. Seminars also provide an opportunity for outside lecturers, visitors from abroad, local foresters as well as forest scientists who are specialists on certain phases of forestry to present a series of topics of current interest. Such stimulations add vitality and variety to the seminar program and are most appropriate in such a program. Divergent contacts and impressions motivate thinking on the part of the students.

Regardless of the type of educational program, the most important factor in any educational endeavor is the teacher. An institution of learning is as good as the quality of its faculty. Library, laboratories, equipment and, in the case of forestry education, college forests, are important educational facilities. But none of these factors compare in educational importance with

ability of the teaching staff to inspire and guide the students along the trails of learning.

In a world forestry program, it is obviously necessary that the faculty have world-wide views and interests. It would be preferable that some have all or part of their training and cultural background in foreign countries, and that others have professional work or travel abroad. At Syracuse University, 15 members of the teaching faculty have had all or part of their formal education in 12 different countries. True, a heterogeneous faculty may cause problems, both professional and personal problems, but as with students, divergent backgrounds and views are the basis for stimulation and fertile thinking in any profession.

Visiting professors who offer regular courses or seminars in their specialty can provide valuable contributions to a graduate group and the permanent faculty. Visiting professors may come on an exchange program and take over courses offered in the ordinary curriculum. This may not always be easy for the visitor or sound for the institution if he is to teach core curriculum courses and has not had previous acquaintance with content and methods used in related courses. It is far better for all parties concerned if the visiting scholar offers elective courses within his specialty. Such an arrangement will also give him more opportunity to carry on personal research and studies which is usually one of the major objectives of such visits. Already many universities have funds for such visiting professorships. It would be to the advantage of our profession if visiting professorships could be made available to forestry schools throughout the world to a greater extent than they are at present.

Change of school advised

Probably most postgraduate students would prefer to enroll at only one school for their entire period of graduate study. Sometimes the college where undergraduate training was obtained may be the best place to do the specific research that interests the student. Here may be the very best place to take the advanced courses that will round off his professional education. In most cases, however, a change of school is advisable. Going to a new school will give him new teachers, new environment, and new impulses that will stimulate educational growth. In German universities, it is common practice to encourage even the undergraduates to enroll for one or more semesters at a school other than the one in which the major part of the education is obtained. Throughout Europe and even more so in America, postgraduate students are encouraged to take their work in new educational environments.

For postgraduate work in world forestry, this practice may be extended further. It seems to me that co-operative agreements could be made among several forestry schools, schools located in different countries. The co-operative agreements regarding postgraduate study should facilitate postgraduate work for students attending two or more schools where they could receive credit for satisfactory work. In the beginning, no doubt, the degree would be awarded by one institution only. This would be by the faculty before whom the thesis would be defended. Eventually it would be desirable to consider having the participating schools confer a joint degree. Such an action would require considerable international understanding and co-operation. It would, if realized, strengthen such a program substantially.

The conferring of the degree, however, is not, or should not be, the dominant factor. The important aim of such co-operative programs would be to help graduate forestry students to receive educational opportunities that develop their intellectual capacities to the fullest and, as far as possible, meet their objectives, while providing a true world forestry opportunity.

It should be possible for the students not only to take formal courses and seminars at the participating institution but also to collect research data at the different places where they would study. This would not be done, of course, in all cases, but many studies in the various disciplines of forestry and its basic sciences do lend themselves to treatment under different climatic, biological and economic conditions. Research under such international arrangements could contribute considerably to better understanding among foresters throughout the world and to strengthen world forestry.

Men with such an education — undergraduate training in their own country, postgraduate studies at two or more forestry schools abroad — would have an excellent background for their professional careers. To their own country, they would bring new impulses, new techniques, and new thoughts that could result in improved research, teaching or practices. Should they choose to work abroad, they would bring with them a sound background both with respect to general international education and specific forestry training.

The civilization we are building and should build is international in character. We should adopt the best possible theories and practices irrespective of their origin. We may want to preserve attractive national traditions. But, for the major share of our culture, we should continually consider, test, reject or adopt theories and practices that can help to shape a better world for humanity.

Co-operation between forestry schools throughout the world, along the lines outlined in this paper, will necessarily cost additional money. There will be the cost of travel to meetings, cost of exchange of professors, administrative costs, probably publication of literature, including outlining and cataloguing the objectives, scope and means of the program. Not the least of these increased costs will be the travel, study and research costs for students.

Fortunately there are private foundations whose objectives include support of such international educational objectives. If and when agreement can be reached between a group of forestry schools which are able and willing to co-operate on extended postgraduate educa-

(*Concluded on p. 192*)

Development of Markets for Forest Products
Needs and Techniques

E. Bryan Latham
Commissioner, Forestry Commission, United Kingdom

The sale and utilization of wood products is not, as we all know, the end-all of forests and forestry. Forests are a necessity to mankind for many reasons, among others to prevent soil erosion, to regulate rainfall, to provide shelterbelts, and not the least because they provide satisfaction to man's sense of beauty and well-being. Nevertheless, in our age, when economics play such a prominent part in all affairs, forests and forestry services are expected in many quarters to pay their way. Forestry budgets find themselves continually reviewed by government auditors. Hence the successful sale and utilization of forest products becomes one of the primary tasks in forest management.

I feel I should start with some definition of the term "forest products" from my point of view. For the purposes of this paper I am taking them to be sawmill logs and veneer logs, hardboard, softboard, chipboard, pulpwood (whether mechanical, sulphite or sulphate), pitwood and other mining timbers, timber for fencing and general agricultural purposes. Other forest products which stand apart from the contents of the actual tree trunk, such as fruit, nuts, oils, etc., I must leave to their respective experts. Your committee gave me a very wide brief and, in order to reduce the subject to manageable proportions in one paper, I propose to deal only briefly with softwood species, which mostly have an established market, then go on to the marketing of hardwoods, which is a much more complicated matter particularly in reference to tropical species, and finally to examine the vast market which includes *inter alia* plywood, hardboard, softboard, chipboard and pulp.

Softwood species are generally clearly appreciated and established from a market point of view. Compared with hardwoods, softwood species are comparatively few, the great softwood forests of the world are well known and most of them have been fairly accurately cruised. In fact, quite a large proportion of the world's softwood output is now being obtained from regenerated forests or plantations. Western hemlock from British Columbia and paraña pine from Brazil are among the last softwoods to reach the international market, although China red pine (*Pinus koraiensis*), which has already reached London in small quantities, may yet prove a worthwhile newcomer.

Paper delivered at the Fifth World Forestry Congress.

Two problems present themselves to large-scale softwood producers. One, the question of integration of all their wood products, and two, the successful marketing of plantation woods and exotics, i.e., softwoods which are being grown in territories other than their original habitat. With regard to the first problem, a number of softwood producing countries have advanced far along the road to complete consumption of the standing tree. Notable examples are the United States of America, Canada and Sweden. The latter country depends upon forest products to maintain a very large part of its national economy, and there large integrated enterprises covering sawn deals, battens and board, hardboard, softboard and pulp increasingly hold the field. In this sphere it is safe to say that the problems of successful marketing are in the hands of commercial experts who well understand their business both to hold the markets they have already won and to continue their expansion.

Exotic softwood markets

Our second heading offers more complex problems. The exotic or plantation grown softwood has to find a new market, or in some cases to break into a market at the expense of oversea imports. The exotic softwood may show different qualities from the same tree grown in the original habitat, and there is a great need for forest research work on these problems. Such problems face the United Kingdom where, apart from the considerable activity of private woodland owners, the Forestry Commission has 1,250,000 acres (500,000 hectares) of woodlands, mostly new softwood plantations. The Forest Products Research Laboratory at Princes Risborough, Buckinghamshire, undertakes for the Commission a well-conceived program of research.

It is right here to pay a tribute to the work of forest research laboratories all over the world, and to acknowledge the stimulation they have received from their respective governments. Notable success in the establishment of markets for exotic softwoods has been achieved in South Africa, Australia and New Zealand.

Promotion of hardwood utilization

But it is in promoting the utilization of hardwood species that forest products research laboratories have probably their largest parts to play. They can assist

in appraising the market values of new species by furnishing accurate particulars of their scientific structure, texture and working qualities. They can also find new ways of using new species by testing them against the special requirements of different consumers. For instance, timbers which are not suitable for lumber have been known to produce excellent veneers. A typical example here is Gabon mahogany. Other timbers have been found to be acid resisting in connection with the use of chemicals. I must point out, however, that oak was found to be the best timber for the making of casks to store wine long before the days of forest products research laboratories!

There must, however, be close co-operation between forest products research laboratories and commercial interests if research is to bring its full value and be of adequate use to the community. Quite frankly, the history of the introduction of new woods to international markets cannot be said to be entirely due to scientific research. In fact in many cases it would seem to be almost a matter of accident or the result of great historical happenings outside the scope of ordinary commerce.

The great expansion of lumber production in the United States of America in the latter half of the nineteenth century was brought about by the enormous demand of the people for a material which would provide them with homes and furniture at short notice as they moved steadily westward from the Atlantic seaboard. Species after species were introduced into the market as their working qualities were found to fit the ever-growing demand. The vast United States home production in due course spilt over into the international consuming markets. On another continent, it is very doubtful if the great expansion of West African timbers, which tend to displace United States hardwoods in Western Europe, would have taken place or at any rate so quickly without the occurrence of the second world war and its consequent disturbances of markets and currencies. This great expansion of timber production in the West African territories and its success in gaining and holding markets will undoubtedly repay the study of economic experts. The original impetus certainly came from the fact that large consuming markets found themselves suddenly cut off from sources of supply to which they had been accustomed for several generations. Without this stimulant it is by no means certain that markets would have been found or at any rate so speedily for such a number of West African species in a comparatively short space of time. Ramin is another example of a wood that was hardly commercially known before the second world war, and now has attained considerable markets, particularly in the United Kingdom and Australia.

The brief outline above of what happened in West Africa opens up a very large question as to whether one day a similar shift in world trade, not on that occasion we must hope arising out of a war, will ever perform the same service for the vast hardwood forests of South America, particularly in the Amazon and Orinoco basins. It almost looks as if, in many cases, hardwood timbers, apart from the use of research in market techniques, must await their turn for a suitable concatenation of circumstances before they can make their way to international markets. Freights, costs of extraction, manufacturing costs, royalties, etc., can vary so enormously in different parts of the globe. For instance, the mahoganies of West and East Africa are largely similar in quality but, as far as the United Kingdom market is concerned, the latter has to face the disability of a much longer ocean journey.

Again, timbers may have a good local market but their hold on international markets may be precarious. An example of this was clearly seen in the United Kingdom following immediately upon the cessation of the second world war. Here, owing to currency and other difficulties, the use of timber was strictly controlled by government licence down to the year 1953. However, in 1946 the Board of Trade produced a scheme known as Hardwood Overseas Procurement Order Part III, under which private enterprise was permitted to import and sell freely hardwood timbers from a number of specified territories. In the peak year, no less than 350 species of hardwoods were brought into the United Kingdom and readily consumed. Such hardwoods as freijo, jequitiba and louro vermelho from Brazil; rauli, laurel and coigue from Chile; amarillo, fernan sanchez and roble from Ecuador; and chan, katon and haldu from Siam temporarily found a remunerative market. When, however, the British Government once more permitted the free consumption of softwoods in 1951, many of these woods were almost immediately driven off the market. Of the 350 hardwood timbers above mentioned, it is doubtful if even half have a secure place in the timber consumption market of the United Kingdom today.

This leads me to the vital question as to how governments and forestry departments can, with the aid of forest product research laboratories, help their timber-producing industries. One way is by enabling the qualities of known hardwoods to be more closely investigated so that particular timbers move higher up the list of successful utilization. An outstanding example of a timber that has so raised its status is ramin. Again it is noticeable that quite a lot of forest research work has been done in the consuming countries as well as in the producing countries. So we must assume that the consumer for his part is continually asking questions about the quality and suitability of various timber species.

It almost looks as if the successful introduction of new species of hardwood into the international market proves to have been largely a matter of individual enterprise, seizing a favorable moment to give a much wider market to a species of timber that has traditionally had a local use in the past. The evidence of a deliberate market technique having produced an immediate result in widening the market for a given timber is so far very scant. Once a timber has reached international status there is no doubt that governments can help or

mar its chances of survival. By raising royalties to excessive levels or placing inordinate export duties on a temporary successful timber, there is always the risk of killing the goose that lays the golden egg.

Hardwood opportunities in underdeveloped regions

We now come to another aspect of hardwood marketing apart from the great international markets of the world. I refer to the great opportunity for marketing timbers locally in the underdeveloped parts of Africa, Asia and South America. In many cases large populations with low standards of living exist in the neighborhood of great forest territories, upon which the local inhabitants make at the present moment very few demands. For instance, the last annual statistics show the following wide variation of consumption of sawn wood in cubic meters per 1,000 population, viz: Europe, 155; U.S.S.R., 390; North America, 515; Africa, 15 and Asia, 35. These figures speak for themselves. Both fortunately and inevitably, the local demand for timber will rise with the standard of living, and hence we must expect much larger local sales. Carefully balanced forest products research studies are needed, however, to determine which timbers will have the greatest value in their home territories and which will continue to be the main producers of revenue through the export trade. For instance, many hardwoods find a ready local use in Africa owing to their insect resisting properties which at the moment have no export value because of their hardness and weight. Already considerable forest research work is being done on a number of territories in Africa and Asia to establish these facts, but more is needed.

An outstanding example is the research work done in Malaya, where the forester is often faced with the problem as to which of several hundred different species of hardwoods he will choose to encourage and which he will suppress. The first step taken in Malaya was to divide the hardwoods into three groups, namely heavy, medium and light. Almost immediately it was decided to keep very few heavy hardwoods in the forest because they required at least 150 years to reach maturity, and under present circumstances their markets are uncertain. On the other hand, it was found that a number of commercially grown medium hardwoods such as keruing could be successfully impregnated with preservatives, and therefore would serve the same purpose for railway sleepers and similar uses. An enormous amount of work had still to be done making tests as to which were the most desirable medium and light hardwoods to encourage in the forest stands. Seeing that durability could be compensated for by ease of impregnation, it was agreed that two of the most important characteristics required in a commercial timber were the ability to "stay put" without disturbance or distortion, and that in these days of mass production it could be easily worked by machine tools. With regard to soft hardwoods, it was also considered that those liable to insect attack should be eliminated as far as possible. It can be agreed that modern insecticides have done much to suppress this risk, but it has to be admitted that these are expensive processes and add to the cost of production. So in Malaya we have a typical example of where foresters have faced up to the problem as to what they should grow in their forests from the point of view of its ultimate market value.

Grading rules and forest policies

An important factor in the successful marketing of new species is the establishment and maintenance of practicable grading rules. Outstanding examples of success in this direction are the marketing of both ramin and Danish beech. Two main groups of lumber grading now hold the field, i.e., the system based upon the theory of the production of a maximum number of "clear cuttings" from any given board, and secondly the so-called "appearance systems" which base their grading on the number of defects allowed to appear in a given sized board. The "clear cuttings" system was originated by lumber producers in the United States, where it became very popular and appears to satisfy the consumer. On the other hand, the United Kingdom market has not taken to it so kindly, and this may well be one of the reasons why West African timbers continue to hold their own there. These latter timbers are still largely graded on the "appearance system" and many consumers feel that this gives them a greater opportunity to make the most economical use of the board when they re-saw it for its ultimate end-use. Stress grading, again introduced in North America, is a newcomer which endeavors to grade on a strength basis, so that the stresses which the given piece of constructional timber can stand may be accurately gauged. If timber is to hold its own for constructional purposes against steel and reinforced concrete, much more will have to be done to expand the production and marketing of stress graded timber, particularly among softwoods.

In addition, foresters themselves have a great influence on the profitable utilization of their timbers by the methods of forestry which they choose to practice, whether by means of 100-year rotations, felling cycles or other forestry policies. Again it must be emphasized that for the successful continuing marketing of timber, settled forest policies must be practiced, otherwise the large capital sums for setting up sawmills, plywood, hardboard, chipboard factories and paper mills will not be attracted to tropical territories. At the present moment, it is an unfortunate necessity that compared with older timber producing industries in Europe, the United States of America and Canada, an enormous proportion of the total tree is lost either by being left in the tropical forest or as sawmill waste. The problem here is to provide an industrial technique and the capital for producing such end products as hardboard, chipboard and pulp. Here the Forestry and Forest Products Division of the Food and Agriculture Organization of the United Nations

is playing its part by carrying out a number of studies relating to the possibility of small-sized plants for converting tropical hardwood waste products into boards and pulp.

Marketing wood products

This leads us to the marketing problems of such forest products as plywood, hardboard, softboard, chipboard and pulp. Again we have to record an almost general story of markets very tentatively built up from small experimental beginnings. It is a historical fact that from the days of Julius Caesar to the end of the nineteenth century there were no basic changes in the methods by which wood was used for the benefit of the consumer. New timbers reached the market, new tools and machinery were invented, but still wood was used in the same basic traditional manner. The dikes were breached by the invention of peeling and the wholesale manufacture of plywood at the beginning of the twentieth century. Now, what with hardboard, wallboard and chipboard, who can say in how many different forms wood will be used in a hundred years time? It is when we come to hardboard, softboard and wallboard that in the shape of the organization known as FIDOR (Fibre Building Board Development Organization, London) we have a deliberately planned campaign to launch new products upon the market from the word go! This organization was established in 1953 and, supported by a voluntary levy, it continues to give valuable service to its members. As mentioned above, plywood was the first material to break away from the traditional use of timber. It is not too much to say that it gained a market more by the experiments of enterprising consumers rather than by any concerted action by manufacturers. Now, however, we find a number of associations engaged both in defending plywood against still later comers, or endeavoring to secure a still larger share of the existing international market for their own national products. For instance, the Plywood Manufacturers' Association of British Columbia (PMBC) has for some time past been conducting an active marketing program on behalf of the plywood products of British Columbia. Success has attended its efforts so that the sales of Douglas fir plywood in the United Kingdom in 1959 were 50 percent above the 1958 figure. A United States organization, also working on the Pacific coast, the Douglas Fir Plywood Association, spent $5 million in promoting sales in 1959. Now the Finnish association of the plywood industry is planning the promotion of sales of Finnish birch plywood in the United Kingdom. Even the National Lumber Manufacturers' Association of the United States of America which used to be so sure of the competitive value of American lumber is now planning a marketing campaign known as " marketing unlimited." It is estimated that this sales promotion campaign will cost $12.5 million per annum, and that it would be basically financed by a contribution of $1 per 1,000 feet on the products of those lumber manufacturers supporting the program. This program has the universal support of the United States lumber press. It will be noticed that practically all the programs outlined above, both for lumber and wood products, have this in common, that they are committed either to defending their markets against newcomer substitutes, or in securing a larger slice of an existing market for their own particular production.

Conclusion

It would seem, therefore, that both the forester and the commercial timber man should have the common aim of marketing wood products in the most economical and attractive forms so that they can hold their own against competitive materials and commodities. This efficiency must be sought in all operations, including growing the timber, processing, shipping, marketing and distributing it. The forester can play his part by hammering out a balanced forest policy that will bring his trees to the market in their prime, and also by deciding which species should be helped and which suppressed. Also, the forester must bear in mind that successful modern processing of wood, whether as lumber or other processed products, demands large capital expenditure, and consequently the commercial man demands above all continuity of policy and a guaranteed production and delivery of his raw material. In this connection the system of management licences instituted in British Columbia following the second world war is being watched with great interest. As is known, the basic idea is to provide continuity of production of all kinds of forest products ranging from lumber to pulp, and at the same time to ensure adequate regeneration of the forests. By his control of royalty payments the forester can also help to a considerable extent the growth of local markets and the consumption of species for which there has so far been little demand. The great need of tropical foresters in these days of sustained yield is above all a liberal forest policy that will bring as many species to market as possible. It should encourage the forester to remember that many species that started their career as so-called secondary timbers now grace the front pages of the importers' price lists.

In the past, as has been indicated above, the timber trade did not concern itself with scientific research. Markets existed and the lumber was dumped into them. It was not until the middle of the nineteenth century that wood as a constructional material faced any very serious competition. Then in quick succession came mild steel, aluminium and other alloys, reinforced concrete and plastics. One of the answers to the new position was the forest products research laboratory, but most of those now doing fine work have only been in existence for a few decades.

To the nineteenth century economist it was axiomatic that the law of supply and demand would ensure that a material would be used for the purpose for which it was best suited. These tenets, however, no longer

hold good. With the large variety of materials available to industry, the principle of eclectic use has lost its virtue. There can be no certainty that, because of its inherent properties alone, any raw material will be selected as the best for a particular use. The only valid criterion today is the suitability of the finished article. The ultimate consumer knows nothing about the raw material, he buys the finished article and judges it as to how useful it is to him. This brings us to the point that wood research directed toward ultimate design has a big part to play in the future. One would like to see a combination where the designer could go to the forest products research laboratory worker and ask him definite questions and receive definite answers as to how wood would behave in any particular set of circumstances to which the designer would wish to subject it.

The study entitled *Trends in the utilization of wood and its products in housing*, prepared in 1957 jointly by the Secretariats of the Food and Agriculture Organization of the United Nations and the United Nations Economic Commission for Europe, states that a progressive translation from sawn timber to other wood products should be faced with equanimity by both the forester and commercial interests. This new state of affairs will not only tend to develop further long-term markets for forest products, but also frequently create markets for lower grade wood in replacement of higher class sawn timber, which in itself may tend to become increasingly scarce. If it were not for the new techniques for the use of the lower grade timber, great markets would be lost to forestry.

For the successful development of markets for forest products, it does appear to be a fact that for the establishment of large-scale board and pulp operations the most reliable information must be provided by forest departments to interested parties, both as to the availability of wood supplies and their likely cost. A difficulty arises here that on the one hand long-term, firm decisions have to be taken on policy, and on the other, owing to possible currency changes or disturbances in markets, some kind of a yardstick has to be provided for a periodical review of the prices of the raw material. This position has already arisen in a number of large timber producing countries, and one is happy to record that almost without fail arrangements have been worked out satisfactorily to both the commercial undertakings and the forest departments concerned.

The same considerations but in different aspects occur in the marketing of new tropical hardwood species. Again, full consultations are the ideal between local forest departments and commercial timber men regarding the quantities likely to be available and the royalties to be paid. It cannot be emphasized too firmly that for the successful marketing of forest products, what is needed above all is a settled forest policy.

CORRIGENDUM

In *Unasylva*, Volume 14 No. 2 page 85, under the title *FAO/IUFRO Committee on Bibliography*, the last two paragraphs were inadvertently transposed. The last part of the section "Classification and cataloguing of forestry film material" is reprinted below:

It is suggested that cards prepared for filing under (1) and (2) above be white and cards under (3) and (4) tinted, and that due regard be paid to the precepts embodied in the Introduction to the ODC, especially Section 5.

An example of the information that should be available on a standard 125 × 75 millimeters (5 × 3 inches) card for a film made, for instance, in Yugoslavia by a German producing agency on the general subject of forest regeneration and the transport problems involved, is given below:

23: 37: (497.1) (084.122) (43)

Title: (in original language, with translation in either English, French, German or Spanish)

Synopsis: (in original language, with translation on back of card if space on front does not allow for this).

Producer:

Distributor:

Date: *Length* (in min.) *Width* (in mm.)

Language version: *Sound* *Color*

Price (local currency): (*a*) for purchase (*b*) for hire

Audience: Schools - General - Technical

Clearance for use on television:

The ODC coding in the top left-hand corner consists, in the above example, of three sets of subheads: 23, regeneration and formation of stands; 37, transport; (497.1) the auxiliary number indicating the physical locality filmed, here in Yugoslavia.

The ODC coding in the top right-hand corner is that of the producer or filming country (here Germany) preceded by the "form" number for films (084.122).

Australian Scrub Clearing Methods

W.B. Kelly
Kingscote, South Australia

The following brief account of Australian land clearing methods was written as the result of the writer's visit to some of the more remote areas of Southeast Asia and Japan, where it was felt that similar techniques might be applied with success. Many of the ideas suggested may not be entirely new. However, the techniques as evolved in Australia are highly developed and have reached a high peak of efficiency. It is hoped that they may well be applied in other countries. Although the capital cost of the heavy machinery recommended is high, its efficiency, when correctly used, will demonstrate that land clearing can be economically carried out.

In Australia, during the past 20 years, large areas of hitherto waste land have been brought under cultivation or sown to pasture. This has only been made possible by the development of new land clearing techniques. The shortage of available manpower has made it imperative that highly efficient methods be used in order to ensure profitable returns. The increasing demand for more land in the comparatively small areas that enjoy a reasonable rainfall have speeded up this work. The techniques that have been developed in Australia could have application in other countries, and the following description of some of these methods may enable those undertaking similar work elsewhere to adapt some of them to suit their own environment, and so save valuable time and effort in experimental work.

It may be thought that the use of large machinery for land clearance is uneconomical when compared with traditional methods in those countries where labor is relatively abundant. However, a comparison of costs will usually show that the reverse is the case. It should be emphasized at the outset that it is not proposed to mechanize agriculture in thickly populated areas. But it is hoped that mechanization of land clearance itself will enable new land to be brought under cultivation quickly and economically in order that more people may be enabled to grow more by their traditional methods.

The introduction of large crawler type tractors opened up new possibilities in land clearing techniques. Land that had hitherto been covered by dense scrub (jungle) and had been considered uneconomical to clear for production by the use of the axe, or with the aid of draft animals, was now looked on in a new light. The bulldozer was an obvious means of removing trees and undergrowth and was used in earlier work. Used alone, however, the bulldozer proved costly and inefficient on all but very heavy trees, and then only when the trees covered land of high value. Other ways were then tried. The scrub roller was first used, and later what came to be known as " chaining," and " logging." A brief description of these methods follows.

The scrub roller

This was one of the earlier machines developed for land clearance. Although it has largely been superseded, it may still have a place in lighter types of scrub, particularly where the scrub is difficult to burn, and where it is not easily crushed by a log or a chain. Scrub rollers are usually made from old steam boilers from 3 to 4 feet (90 to 120 centimeters) in diameter and from 10 to 12 feet (3 to 3.60 meters) in length. An axle from 2 ½ to 3 inches (6.5 to 7.5 centimeters) in diameter is fixed through the center of the boiler. The end of the roller through which the axle passes must of necessity be firmly reinforced. A large bearing, usually of wood, is placed on each end of the axle. On these bearings a frame is constructed, usually of native timber. The frame is so designed that timber on the frame will strike trees to be rolled before the boiler strikes them.

Figure 1. – *Construction of scrub roller.*

Figure 2. – *Center pull scrub roller.*

FIGURE 3. – *Construction of side pull scrub roller.*

FIGURE 4. – *Scrub roller. Rear view.*

FIGURE 5. – *Scrub roller. Rear view.*

In this way the tree is bent over, as shown in Figure 1, allowing the roller to run up it and complete the crushing operation. The roller frame may be so designed that it will pull either from the center, as in Figure 2, or one side. A frame pulled from the center is easier to construct and may be used in light short scrub. However, one pulled from the side has the advantage that the tractor operates in the area already rolled, and there is less danger to the operator from falling trees.

Rollers may be attached to the tractor in a variety of ways. They may be attached directly to the frame. This is very convenient where the scrub is not larger than the length from the boiler to the tractor. Otherwise it is highly dangerous to the operator. Another method is to allow the front of the frame to rest on a skid. The roller is pulled by chains as in Figure 3. These chains run through a loop of chain on the front of the frame. This allows the roller to be guided. When using this method it is advantageous to counterbalance the front of the frame, in order to make the whole machine more maneuverable. This is clearly demonstrated in Figure 4, which shows the construction of a roller from the rear.

A third and perhaps the best method of attaching the roller to the tractor is shown in Figures 1 and 5. The front of the frame is attached to a large axle supported by large waggon wheels. A pole connects this assembly to the tractor.

An excellent crushing effect is achieved by welding lengths of 3-inch (7.5-centimeter) angle iron to the boiler, spaced from 12 to 18 inches (30 to 45 centimeters) apart, as shown in Figure 4. This creates a chopping action which helps to prepare the scrub for later burning. It is emphasized that rollers are primarily of use in light types of scrub which are not easily crushed. However, they have one other advantage, namely, that they do not require very large tractors to pull them. Tractors from 35 to 50 draw-bar horsepower are adequate for the purpose and with these from 20 to 30 acres (8 to 12 hectares) can be rolled in a day, depending on conditions.

Chaining

This is an extremely simple operation and merely involves pulling a large chain by two tractors. It may be used in light scrub that is easily crushed, and heavy trees among which there is not much undergrowth. In light scrub relatively small tractors may be used. However, experience has shown that large tractors pulling a long length of chain are more efficient and economical for large areas. The chain they pull is obviously heavier — from 1 ½ to 2 inches (38 to 50 centimeters) diameter — and this has a greater crushing effect. Moreover, large tractors may operate up to 100 yards (90 meters) apart, so that areas of up to 100 acres (40 hectares) per hour may be chained. It is indeed spectacular and impressive to see this operation performed, as it has been on large areas of scrub in South Australia.

Where trees are denser, tractors must of necessity work much closer together, perhaps 20 to 30 yards (18 to 27 meters) apart on account of the greater load. If trees are close together, this is no disadvantage as the chain is held off the ground by falling trees and so attains more leverage on the trees. Chains should be of good quality steel to avoid breakages. Larger diameter poor quality steel chain causes too much dead weight.

Although this operation is simple, it calls for skill on the part of the operators. Above all they must work as a team and be constantly aware of the diffi-

culties of the other driver. They should attempt to keep the tractors level. If one tractor gets too far ahead it may be dangerous for the driver of the other. The noise of the tractors makes it more difficult to keep them level than may be imagined. When turning corners it is as well for the driver of the tractor on the " inside " to reverse his machine a short way in order to allow the outside machine to turn without incurring too much side thrust.

Tractors may have tree pushers or bulldozers attached. However, experience has shown that bulldozer blades tend to restrict the vision of operators and cause unnecessary weight, thus increasing maintenance costs. It has been found that, if the blade itself is removed and the frame that carries it is used alone, the frame will do the work required. This sometimes consists of giving larger trees a glancing blow when passing which allows the chain to remove them more easily. Chaining has been successfully used in timber up to 70 feet (20 meters) high.

Logging

Logging, as the term is applied in Australian land clearing, is carried out in much the same way as " chaining " except that a log is dragged at the end of the chain in order to crush trees and undergrowth. In light scrub a log may be pulled with one tractor, as in Figures 6 and 7. The log should be heavy so that it does not bump off its work. Logs should be about 2 feet (60 centimeters) in diameter and about 40 feet (12 meters) in length for one tractor operation. This calls for a tractor of the class of 70 h.p. or upward.

FIGURES 6 AND 7. – *Logging, using a tractor to each log.*

A chain is attached to the log about 18 inches (45 centimeters) from both ends. The other end of each chain is brought to within about 6 feet (2 meters) of the tractor and a single chain is connected from there to the tractor. This allows the tractor to back and turn without fouling the chains. The chains should be cut into the logs to prevent slipping and save wear on the chain where the log touches the ground. It is also advisable to staple the chain on to the log with large mild steel staples in order to prevent the chain slipping round on the log and so damaging it.

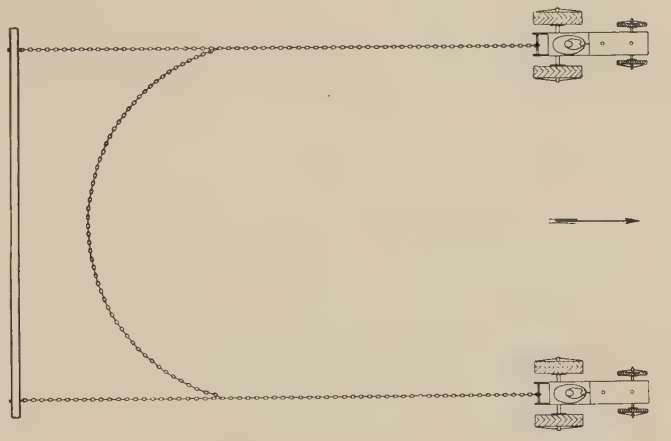

FIGURE 8. – *Chain used to bend scrub. Log used to crush scrub.*

Logging is usually carried out by two tractors having a chain from each tractor directly to each end of the log. When two tractors are operating logs of about 50 feet (15 meters) in length are usually used. Considerable strain is put on the center of a log when used in heavy timber. To counteract this, chains are often used in conjunction with the log as shown in the diagram. Chains thus take the brunt of the work, allowing the log to keep the chain spread and to perform the crushing operation, as shown in Figure 8.

In heavy scrub it is usually difficult to obtain good pictures of logging operations, though Figures 9, 10, 11 and 12 give some idea of what is achieved. However, very much heavier scrub than is shown in these pictures can be successfully logged if large tractors are used.

FIGURES 9, 10, 11 AND 12. – *Four photographs showing logging methods.*

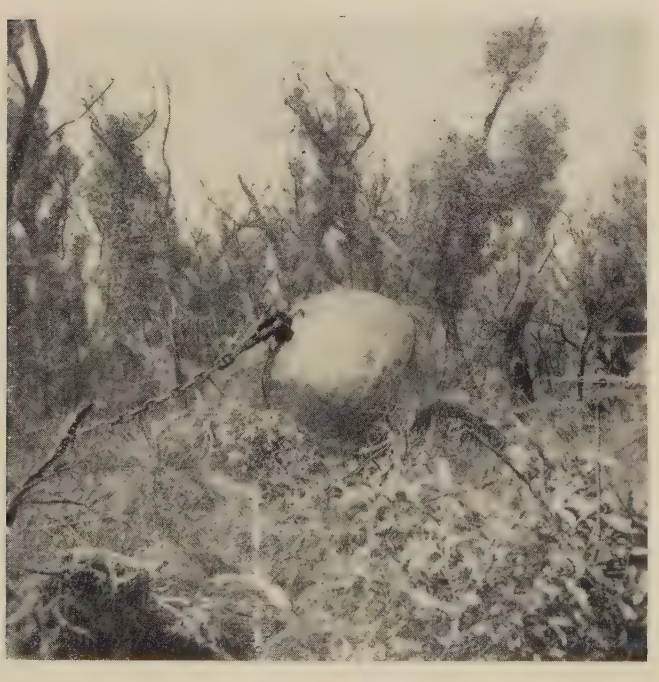

FIGURE 13. – *The high-ball.*

Areas of 50 acres (20 hectares) per day are cleared in heavy-type scrub, while 100 acres (40 hectares) per day are comfortably cleared in medium-type scrub. It is again advisable to use high quality steel chain for this operation. The same skills are required of the operators as for chaining if accidents are to be avoided. Chains should be of sufficient length to avoid danger from falling timber.

The high-ball

A device which has been used in very heavy scrub is the high-ball (Figure 13). It consists of a steel ball of about 7 ½ feet (2.3 meters) in diameter and weighing from 5 to 7 tons, through which is passed a heavy axle. A heavy chain is secured to each end of the axle in such a way that the ball can revolve without fouling the chain. The other end of each chain is connected to a heavy tractor, and the operation follows in much the same way as in "logging."

The object of the high-ball is to keep the chain well off the ground and so obtain a greater leverage on large trees. With this device, trees up to 100 feet (30 meters) high have been removed. The high-ball, however, has some disadvantages. The initial cost is quite high owing to the great strength that is required. Also its weight makes it difficult to transport from one area to another. Experience has shown it to be costly equipment on all but very heavy timber covering land of high production value.

FIGURE 14. – *After a good burn.*

FIGURE 15. – *Bulldozer with scrub rake attached.*

Burning and clearing up

Where conditions permit, a thorough burning of areas that have been rolled, chained and logged, greatly eases subsequent operations. If possible, burning should be carried out when the optimum amount of material will burn and the right day to burn should be chosen very carefully.

The results of a good burn are seen in Figure 14. Much of the material that is left may be removed by hand. If, however, a machine must be used, a bulldozer blade with rake attached, as in Figure 15, is most convenient. Bulldozers without rakes prove costly and inefficient, because they pick up too much dirt and so make the subsequent removal of the debris more difficult.

These same machines may be used where a burn is not possible or where the timber is required for fuel or other purposes. However, a good burn obviously reduces considerably the cost of clearing up operations.

The stump-jump plow

Land clearing as at present practiced in Australia would be impossible without the stump-jump plow. This implement was invented in Australia over one hundred years ago and has been gradually developed into the very rugged machines of today. These implements will work over country that would seem impossible to cultivate. It has been said that they will plow up anything short of railway tracks. Apart from Australia and New Zealand they have been used with success in Canada, England, Greece, Nigeria, Papua, Scotland and South Africa. However, it is probable that their contribution to the pioneering of virgin land is only in the initial stage and that, when their usefulness is realized by people of other countries, these implements will be even more widely used.

A stump-jump plow of the heavy disk type is shown at work in thick undergrowth in Figure 16. Although it is not generally recommended that this type of plowing should be attempted, the picture does show something of the possibilities of the implement. A close-up of a plow is shown in Figure 17. A careful study of this picture shows the fourth disk from the right rising over a fixed obstacle. This is made possible by the pivoting action of the arm that holds the disk. The far end of each arm is connected to a heavy tension spring, as shown in the picture. This allows each disk to rise over any obstruction that cannot be removed, while at the same time exerting great pressure on it. A good example of what can be achieved is shown in Figure 18. The obstacles on the left of the picture

FIGURE 16. – *Heavy stump-jump disk plow in operation.*

FIGURE 17. – *Close-up of stump-jump disk plow.*

FIGURE 18. – *Before and after stump-jump disk plowing.*

FIGURE 19. – *Two stump-jump plows pulled by large tractor.*

FIGURE 20. – *Aerial view of stump-jump disk plows in operation.*

FIGURE 21. – *After the stump-jump plow.*

would prove extremely hazardous to conventional implements, but the stump-jump plow has brought the ground to a workable state, as shown in the right of the picture.

These plows are available in sizes from 4 to 8 disks. It takes approximately 5 draw-bar horsepower per disk to pull them. They may be hitched in pairs, as shown in Figure 19, for use with large tractors. An aerial view of stump-jump plows in operation is shown in Figure 20.

Subsequent operations

As has been suggested, the heavy disk stump-jump plow removes many obstacles from the ground. An extreme case is shown in Figure 21. Many ingenious machines have been evolved for the removal of such material, but it is doubtful if their use would be justified in countries where labor is abundant. However, the use of lighter type stump-jump disk plows for subsequent cultivation is highly recommended. From then on it may be advisable for traditional methods to take over.

It cannot be too highly emphasized that the Australian stump-jump disk plow is perhaps the most valuable development of all the equipment described. Its use may open up many new areas for cultivation and pasture.

APPENDIX

ESTIMATED COST OF OPERATIONS DESCRIBED

	Australian £ per acre	*U.S.$ per hectare*
Scrub rolling (light scrub)	1.10.0	8.15
Chaining (light scrub – with tractors 100 yards [90 meters] apart)	0. 4.0	1.09
Chaining (heavy scrub – with tractors 30 yards [27 meters] apart)	0.15.0	4.08
Logging (light scrub – one tractor per log)	0. 6.0	1.63
Logging (medium scrub – two tractors per log)	0.12.0	3.26
Logging (heavy scrub – two tractors per log)	1. 0.0	5.48
High-ball (very heavy scrub)	2.10.0	13.59
Heavy disk plowing	2. 5.0	12.23

Influence of Delivered Prices of Forest Produce on Silvicultural Practice in a Developing Forest Economy

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New Zealand provides a classic instance of a developing forest economy. It likewise provides a classic instance of the influence of prices on silvicultural practice. If the country's wasteful use of its virgin forest resource was typical of colonial development, its attempted correction by large-scale planting of rapidly growing exotics has been quite abnormal. Instead of plantings of each species being more or less uniformly spread over anticipated rotations, all were compressed into short periods representing from 5 to 20 percent of such rotations. Hardly had establishment been completed when the second world war broke out to create such a shortage of manpower that just when silvicultural treatment was most needed none could be carried out. The same condition continued well into the postwar period.

With the outbreak of war timber came under official price control, and has so continued ever since. It has in fact been under some form of price control for 24 years. As it was clear by 1952 that long continued price control was defeating the purpose of national forest policy, the matter was brought under parliamentary debate by suitable review in the Annual Departmental Report by the Director of Forestry. As a result of both Government and Opposition agreeing that the provision of cheap timber for house building was all important, subordination of forest policy to timber price control became bipartisan in character and still continues so. Peculiar as these conditions are it is nevertheless possible to draw many valuable lessons from the interplay between economic and political factors as they affect the silvicultural management of any country's forest resources, whether they be indigenous or exotic.

The author prepared a paper on " The Influence of Markets on Silviculture " for the seventh British Commonwealth Forestry Conference. It studied the impact of the great depression, the second world war, and the postwar economy upon the management of New Zealand's exotic forest resource. The purpose was to show how the conditions peculiar to these periods were turned to the advantage of the over-all national forest policy both by administrative control of the indigenous resource and development of integrated industries; and how thereby it was possible to alleviate the harmful effects of compressing the establishment of the exotic resource into a very short period. Ostensibly written to explain what had occurred, the paper in fact tended to show the compression of establishment and the lack of silviculture in the most favorable light possible. This paper has been written to highlight the technical and administrative problems created by large-scale exotic forest establishment compressed into a very few years, and the subsequent neglect of silviculture. It thus tends to present New Zealand exotic forestry in its least favorable light.

Paper submitted to the Fifth World Forestry Congress.

Developing versus highly developed forest economies

The decision of the Organizing Committee to distinguish between highly developed and developing forest economies was a wise one and of profound importance to the profession. Most reference works and text books the world over are based upon the concept of a stable forest economy. Much theory and practice proceed on a similar concept even though stable conditions do not exist and there is in fact a developing forest economy.

For the purpose of this paper a developing forest economy is regarded as one in which a country is in process of creating a forest capital, as distinct from a highly developed economy in which a country is already in possession of a forest capital adequate to its foreseeable needs and under sustained yield management for the maintenance of a widely diversified forest products industry.

The evolution of exotic forestry in New Zealand

The history of forestry in New Zealand is probably typical of colonial development in the nineteenth century. Much of the country, both lowland and high country, was under a dense forest cover, a great deal of it comprising a merchantable timber crop, but so remote from the world markets that it was a liability and not an asset to those pioneers who sought land for agricultural and pastoral development. On a conservative estimate not more than 10 percent of the merchantable forest growing on the land cleared for farming development was converted to sawn timber either for local use or for export to Australia — the only market within practicable reach. Exploitation eventually spread from the fertile lowlands to the less attractive hinterland and at such a pace that within a century of the first land settlement it became apparent that only by

the establishment of a supplementary capital resource of rapidly growing exotics would the country be able to maintain self-sufficiency in timber supplies.

In 1925 the New Zealand government accepted and implemented a recommendation by its first Director of Forestry, Mr. L. McIntosh Ellis, for the establishment of 300,000 acres (120,000 hectares) of rapidly growing exotics over the following ten years. The purpose was to assist in meeting an expected annual timber requirement of 650 million board feet by 1965, by which time the indigenous forest resource would no longer be capable of wholly meeting such a demand for anything but a short period.

The compression of establishment into a ten-year period, even for such a short rotation species as *Pinus radiata*, was the result of previous experience in the field of national forest policy. Originally sponsored in 1870, exotic tree planting by the state did not commence until the turn of the century. But with numerous public agitations, a Royal Commission, and repeated departmental urgings, only 40,000 acres (16,000 hectares) had been planted by 1925. Fortunately, the first Director of Forestry conceived it as his duty, not only to alert the country to the seriousness of the situation, but to persuade government to overtake the arrears of forest establishment accumulated through past *laissez faire*.

A colorful personality with the prestige of overseas experience, Ellis created a wave of popular opinion which has outlived its expected ten years to carry national forestry on its crest ever since. It resulted not only in completion of his original program ahead of schedule, but in the generation of a boom program of private planting which established another 300,000 acres of rapidly growing exotics. Both state and private programs originally envisaged concentration upon the use of *Pinus radiata*, but only in the case of the private sector were suitable sites available to allow virtual attainment of this objective. In the case of state plantings a significant acreage of *P. radiata* was established on sites which had to be replanted to more suitable species.

With the development of the great depression of the early thirties the state program was accelerated and completed ahead of schedule, just at the time when public works of all kinds became essential for the relief of unemployment. However, an overseas visit at that time by the author confirmed the growing conviction that *P. radiata*, because of its vulnerability to a wide variety of insect and fungal pests, was being "overplanted." It was therefore decided that with the availability of unemployed labor at low wage levels this inherent risk should be corrected by extensive planting of the widest possible diversity of other rapidly growing exotic conifers, the limiting factors of course being site and seed supply. *Pinus radiata* continued to be planted, but only on the most suitable sites. The objective was to produce as rapidly as possible an annual surplus of 50 million cubic feet (1,400,000 cubic meters) of raw forest produce for export in the form of timber, pulp, or paper according to the manner in which Australia and eastern markets for these commodities might develop in the interim between planting and maturity.

In retrospect it might appear that much of the low cost unemployment labor available during the great depression could have been more usefully employed on tending some of the earlier planted stands than on planting new ones. The fact is that not only was the supervisory staff so inadequate as to preclude even satisfactory stocking or blanking of many areas, but departmental knowledge and experience of silviculture was so limited that poor value and much damage could well have resulted from any large-scale diversion of planting labor to tending work. Actually there were a few such mistakes.

With the outbreak of the second world war, the Director of Forestry became Timber Controller and as such had the responsibility of conserving manpower in respect not only of forest establishment and tending, but also of logging and milling. In the initial stages before the involvement of the United States, establishment and tending virtually ceased and timber production was curtailed. For the rest of the war manpower was barely sufficient to provide protection services to forestry, but with the United States taking over responsibility for the Southwest Pacific theater of operations, timber production had to be substantially increased, and logging and milling thenceforth commanded a high priority for available manpower.

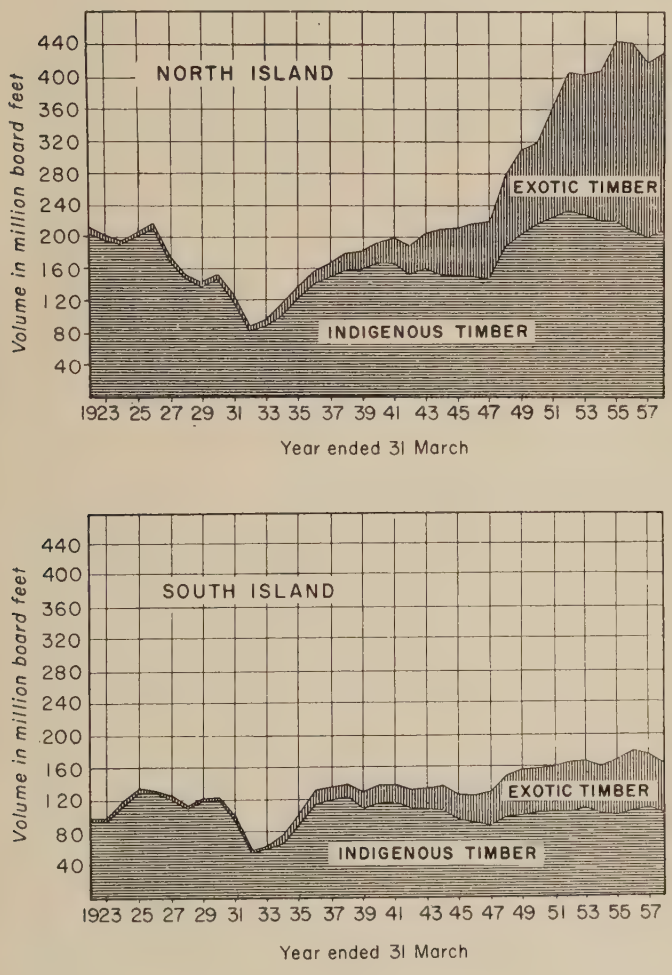
This gave the forest and timber administration an unexpected opportunity of accelerating the development of the national forest policy — a policy directed toward the rapid substitution of exotic for indigenous timber supplies, thereby rationing and conserving the dwindling indigenous forest resources. The imperative necessity for conserving manpower in timber production thus made it both logical and feasible to integrate a national wartime timber production policy with the national forest policy. As indigenous sawmills exhausted their tributary standing timber supplies they were drifted out of production, and their staffs transferred either to other indigenous sawmills, or preferably to new or existing exotic sawmills. The premise was that consolidation of production nearer to established labor or consuming centers would be more economical, not only of manpower, but of essential supplies and transport. As a result, during the second world war there was a spectacular expansion of exotic sawn timber production which has continued almost without interruption ever since. It would have been even more spectacular had the state owned a larger proportion of the standing indigenous resources.

Since 1952 it has been practicable to continue the wartime policy of withholding new state forest resources from mills cutting out on old state forest locations, but it has not been feasible to persuade owners of Maori indigenous resources to do likewise. Because of this, the production of Maori-owned indigenous timber has increased fourfold since the war. Significantly, however, other private owners of indigenous forest have refrained

in most cases from increasing production in order to ration out their resources as long as possible, and in the hope that this would favorably dispose the state to their future claims for indigenous state forest.

All this has been possible only because of a world-wide shortage of timber over both the second world war and its early postwar period. With such limited supplies of indigenous and imported timber available, consumers were then forced to use exotic or go without. In essence there was a sellers' market for 17 years, during which annual exotic production increased from 30 to almost 300 million board feet. Indigenous production remained virtually static at just over 300 million board feet throughout that period. It is extremely doubtful if, in the absence of the peculiar conditions of the second world war and the early postwar years, annual exotic production would have risen even to half its present level.

FIGURE 1. – *New Zealand: Production of Rough Sawn Timber (indigenous and exotic)*



Under such conditions of acute shortage and forced utilization, the sawn exotic product was poorly manufactured, badly graded, and ill seasoned. Naturally enough, not only wood users, but architects, engineers, and specifying and lending authorities tended to resist its substitution for the better manufactured and more valuable indigenous timbers. It was not until a buyers' market developed on both the domestic and the export markets in 1956 that exotic producers were forced to improve both the production and merchandizing of their product. Once this was achieved, the longer length specification of the exotics, combined with their ease of preservative treatment and of working, enabled them to capture some of the markets hitherto dominated by indigenous timbers. In particular they captured the structural framing field in the North Island, while in the cut-up field the factory grade of radiata pine commands a wide market both in New Zealand and in Australia. By improved servicing, the exotic producer is now in a very much more powerful position to compete with the indigenous producer.

Figure 1 demonstrates clearly the trend of both indigenous and exotic production over the period 1923-57, lending force to the claim that New Zealand is a classic instance of a developing forest economy.

The impact of insect and fungal attack

Exotic forestry in New Zealand has not been without its insect and fungal troubles, but all have been of a secondary character. Probably only because of its geographical isolation has the country been free of any epidemic attacks of a primary nature.

On the pumice soils of the North Island, many of the pine stands, and particularly those of *P. radiata*, are characterized by a large proportion of malforms on all sites, the malformation of individual trees increasing with low stocking. Elsewhere on the poor clay sites in the far north and on the shallow gravelly sites in the south the proportion of malforms is lower than on either high quality agricultural loams or pure sandy sites. It is generally true that the poorer sites yield shaplier trees, more lightly branched although smaller, and with considerably less "natural mortality" than is met with on the better soils.

Many parts of New Zealand occasionally experience late spring frosts of great severity. In young *P. radiata* stands, these cause localized splitting of many leading shoots, thereby allowing infection by *Diplodia* or *Phomopsis*. Death of the leader and the subsequent development of double leaders often result. In the original ten-year establishment program a spacing of 8 feet by 8 feet (2.50 × 2.50 meters) was widely used. This gives a nominal stocking of 680 per acre (1,680 per hectare), a number which proved quite inadequate to take possession of the site where the young stands suffered any significant mortality from drought or frost and subsequent fungal attack. And because of the pressure under which the program operated, beating-up to replace postplanting mortality was seldom possible. Even the 6 feet by 6 feet (1.85 × 1.85 meters) spacing — 1,210 per acre (3,000 per hectare) — adopted for some areas, often failed to yield a satisfactory final crop of well-formed trees in these circumstances.

Wet and dry periods of several years' duration likewise follow a cycle of about ten years, and a series of

dry years favors the build-up of *Sirex* populations to epidemic proportions. Happily, however, damaging attacks by these wood wasps have so far been limited to trees with weakened sap flow due to the prolonged moisture deficiency. Significantly many of the malforms die, and in untended stands the damage is often spectacular. It is usually worse in the denser 6 feet by 6 feet stands of *P. radiata* than on the 8 feet by 8 feet stands, some of the former being decimated to the stage where only 30 green trees per acre (75 per hectare) are left at maturity. Some of these trees successfully resisting attack subsequently put on the extraordinary annual diameter growth of 2 inches (5 centimeters) for the next two years.

In essence, the epidemic *Sirex* attacks have killed virtually all those trees which should have been removed earlier in thinning, an operation rendered impossible by the war. The maximum basal area of *Pinus radiata* which the pumice sites of the North Island appear to be capable of sustaining against epidemic attacks of *Sirex* is about 200 square feet (20 square meters), giving at 30 years on Site II quality a growing stock of 7,000 cubic feet (200 cubic meters) to a 6 inch (15 centimeters) top diameter, and a current annual increment of 300 cubic feet per acre (20 cubic meters per hectare).

In view of these experiences it is not altogether surprising that both drill-sown compartments and fire-regenerated stands with stockings up to 10,000 and 500,000 per acre (25,000 and 1,250,000 per hectare) respectively are yielding untended, even on poor sites, more large, lightly lateralled, and better form trees than any other untended stands. To achieve the same result, much genetical research is currently being developed to reduce the high cost of thinning and pruning the 6-foot and 8-foot spaced stands.

Timber price control in New Zealand

As a result of the depression of the early thirties the bottom dropped out of the timber market, with the annual cut falling from 300 million to 150 million board feet — most of it sold at well below cost of production. Prices remained at these levels even after the advent of the first Labor Government which, on coming to power at the end of 1935, restored wages to the 1931 award levels. In order to preserve the purchasing power of these wages the government negotiated an agreement with the timber industry whereby any advances in price were strictly limited to proven increased costs arising from both the restoration of wage levels and the increased cost of imported supplies and equipment. The idea was that the increased demand for timber arising from the government's large-scale state house-building activities would make the depression level of prices remunerative to the industry.

This gentlemen's agreement on prices operated until the outbreak of the second world war, when it was replaced by official control under appropriate wartime legislation. Official timber price control has continued ever since. With rare exceptions, the original basis of control has been observed, with increases limited to the covering of costs beyond the control of the industry — that is due to increased wages and increased costs of supplies, plant and equipment. As originally adopted by the 1936 gentlemen's agreement the base prices of exotic and indigenous timbers were in no way related to one another. They merely reflected the then fortuitous depression prices for two classes of timber which were at that time being used largely for different purposes, and were not much in competition, with only about 35 million board feet as compared with more like 260 million board feet of indigenous timber.

At that time exotic timbers were being used mostly for the manufacture of the poorer type boxes and crates. The only purpose for which they were used by the building industry was for concrete boxing. Then as now, the exotic timber was knotty as compared with the clear and defect-rare grades of indigenous timbers. The latter therefore dominated not only the building and cut-up fields but virtually every other type of wood use, including manufacture of the better types of boxes and crates. Nevertheless, so great was the oversupply of the indigenous timber that, under the impact of the depression, the prices for indigenous timber were relatively very much more depressed than those for the exotic timbers. Timber price control, therefore, commenced with indigenous timber prices far too low, rather than with the prices of exotic timber too high. Neither was remunerative, even in covering costs of production.

As usual with the maintenance of price control in the face of imperfect coverage and oversupply, not only has it become increasingly ineffective, but there has been a gradual retreat from the original base relationship between the prices of indigenous and exotic timbers. Until recently the basic anomaly arising out of this relationship has been that producers of exotics have been forced to sell much of their production — at best only medium quality timber — almost as highly priced as indigenous grades of very much higher quality. Naturally, the consumer has preferred to buy the indigenous product and has done so while supplies have been available.

The few exceptions to the general rule of limiting price rises to proven cost increases have been due to the development of uneconomic conditions in the industry, arising out of the time-lag between the development of increased costs and the approval of increased prices. The cumulative effect of a succession of such time-lags has forced the price control authority to approve from time to time special increases to improve the general economic return to the industry.

Superimposed on the general situation has been the postwar evasion of price control by a realization that legally control was limited to the prices of sawn timber. Just as soon as it became appreciated that there was no price control either over the basic raw material, whether in the form of standing timber or of logs, or over the cost of sawing or over the end-products such as manufactured joinery, and wooden houses, buildings,

etc., a revolutionary change in the composition of the timber industry set in. Not only timber merchants but contractors and house builders commenced leapfrogging of sawn-timber price control. In some cases they purchased standing timber and logs and had the material logged and/or sawn to yield the finished product at costs much in excess of approved prices but for which they could compensate themselves by charging the timbers as manufactured joinery and houses at high enough figures to return a handsome profit. In other cases merchants and contractors purchased sawmills outright with the same end result.

In the face of the administrative action by the Forest Service to curtail production from state forest, the immediate effect of this change in the industrial structure was to trigger off large sales of Maori-owned resources in the form both of standing timber and of logs at prices anything from twice to thrice their economic value as related to controlled sawn timber prices. Eventually significant supplies of sawn timber produced via this uncontrolled route became surplus to owner-user requirements and were placed on the open market at higher than approved prices. As such producers were prepared to defend their right to recoup themselves by selling at high enough prices to return a profit on proven costs of production in efficient logging and milling operations, the industry was awarded another economic increase to accommodate the situation.

In the case both of normal and of economic rises the approved increases were invariably larger for indigenous than for exotic timbers. It was therefore only a matter of time before various developments inexorably tended to correct the disregard of economic laws implicit in the whole system of partial price control. With the ever increasing disparity in indigenous and exotic timber prices the competitive power of the exotics increased. Likewise, as the production and costs of indigenous timber from Maori resources increased and extended from a sellers' to a buyers' market, not only did the lower grades of indigenous timber from all sources become much more difficult to sell, but the prices of standing timber and logs from Maori resources have tended to fall quite significantly. Concurrently the prices of standing timber and logs from state forest resources have risen to the new economic levels determined by the increases in approved prices.

The basic cause of all these developments was the operation of the old law of supply and demand. With a surplus in total supply — that is indigenous plus exotic timber — the producers of exotics were forced to service the consuming public sufficiently well to overcome some of its preference for the indigenous timber. The position today is that even on a buoyant domestic market, though still in the buyers' favor, both indigenous and exotic producers are experiencing the same difficulty of quitting their lowest grades. While there is some valid value relationship between alternative grades of the indigenous and exotic timber, nevertheless approved prices continue to hinder optimum integration of the two classes of timber. Similarly, there are remnants of restriction on the use of exotics based upon both prejudice and administrative inertia.

Withal even optimum integration under existing conditions is unlikely to give the exotic grower an adequate return. Due to lack of silviculture his first rotation crop is producing such knotty logs that they are yielding nothing but low and medium grades. Without any significant quantity of highly priced defect-free or defect-rare grades he is unable to realize a remunerative stumpage for sawlog material. It is pertinent to observe, however, that even had no war intervened the compression of establishment of *P. radiata* into 10 years, instead of being spread over 40 or 50 years, would most likely have precluded intensive silviculture of any but the best stands and would have left the bulk untended. In retrospect there is little doubt that finance, manpower and supervision would have been seriously limiting factors in coping with the corresponding compression of silvicultural work into the short span of years during which tending is practicable in any such short rotation species as *P. radiata*. Equally important is the point that only interim experience has developed and is still developing correct silvicultural techniques.

There is no doubt that with the removal both of price control and of use restrictions the prices of the clear and defect-rare grades of indigenous would rise somewhat. This would have the twofold effect of restricting their use to essential purposes, and allowing the wider use of exotics for medium grade uses, thus returning higher prices to the exotic producer. Finally, this would return to the forest grower a higher price for his standing timber, which at the present time is so low that even with the high profits returned by paper and/or fibreboard products from integrated plants, it returns only about 3 percent compound interest on the original costs of establishment and maintenance over the last 40 years. Unfortunately these are but a fraction of the cost that it would now take, either to regenerate the crop naturally, or re-establish it *de novo* and main tain it over the next rotation. This is the essence of the financial problem which faces the New Zealand forest grower.

It is in striking contrast to the position of the Australian exotic forest owner who enjoys the advantage of having the price for his end-product determined by the high cost of landing New Zealand exotic timber in his nearby market. Thereby he secures not only the equivalent of the New Zealand price for standing timber but in addition the whole of the heavy trans-Tasman shipping costs. Australian stumpages therefore tend to be five times as high as New Zealand's exotic stumpages. As a result the Australian growers of *P. radiata* are able to apply such intensive silviculture as to force converters to saw logs down to a diameter inside bark of 3 inches (7.5 centimeters), as compared with a New Zealand economic minimum of more like 6 to 9 inches. Only in its few integrated plants is New Zealand able to use profitably any large quantity of the smaller material for pulp and paper.

Elsewhere the market for posts for preservative treatment is so small as to be insignificant. Likewise the market for fuelwood is extremely small. Neither market is very remunerative.

No better instance of the influence of prices upon silviculture could be found than in this contrast between New Zealand and Australia. New Zealand, with a huge temporary surplus of exotics, is not only permitting the sale of logs to Japan, but is receiving such a poor return to the forest grower that both re-establishment and further expansion of the exotic resource, as well as the optimum silvicultural management, are threatened by the continued operation of price control and of prejudiced use restrictions. Australia, with an enormous shortage of softwood supplies, necessitating annual imports of 400 million board feet, is able to protect its exotic growers so that the stumpage on their thinnings is five times that for New Zealand clear fellings, thus allowing optimum silvicultural management.

Without questioning the general desirability of a policy of economic stabilization during any war period, it would appear in retrospect as if a more liberal attitude could well have been taken by the government and the price control authority in the case both of the original base prices and of subsequent price rises. With stumpage as a residual value the forest grower has suffered the most, and though admittedly it was a shortage of manpower rather than of finance which prohibited silviculture during the war and early postwar periods, there is little doubt that interim strengthening of forest revenues would have ultimately resulted in a more sympathetic approach to such subsequent silviculture as was still practicable. The same effect would have resulted from a more liberal allowance to converters, whether they were sawmillers or pulp and paper manufacturers who were also forest owners. In actual fact, as control has relaxed and profits have increased, so have private forest owners tended to increase their silvicultural activities.

Nevertheless, it is necessary to terminate this section of the report with the inescapable conclusion that had it been possible to apply the correct silviculture as and when it was required, not only would the incidence of insect and fungal attack in the exotic forests been trifling but the substituting of exotics for indigenous timbers would have occurred automatically through preference of the wood user for the easy drying, treating and working qualities of the defect-free or defect-rare grades yielded by tended stands of general purpose exotic softwoods. It follows that the exotic grower would have received a very much higher stumpage, encouraging him to expand his resource and still further intensify his silviculture.

The influence of long-term and short-term prices on forestry

In an effort to assure himself of the long-term financial prospects of exotic forestry in New Zealand as a source of supply for the international timber trade, the author ordered in the early postwar period a study of the long-term trend of timber prices relative to the movement of general prices. He wished to test a theory that, with the ever increasing remoteness of high quality virgin softwood lumber supplies as one forest region after another was exploited and exhausted, timber prices must be increasing relative to general prices.

FIGURE 2. – *The Relative Movement of Prices in the United States*

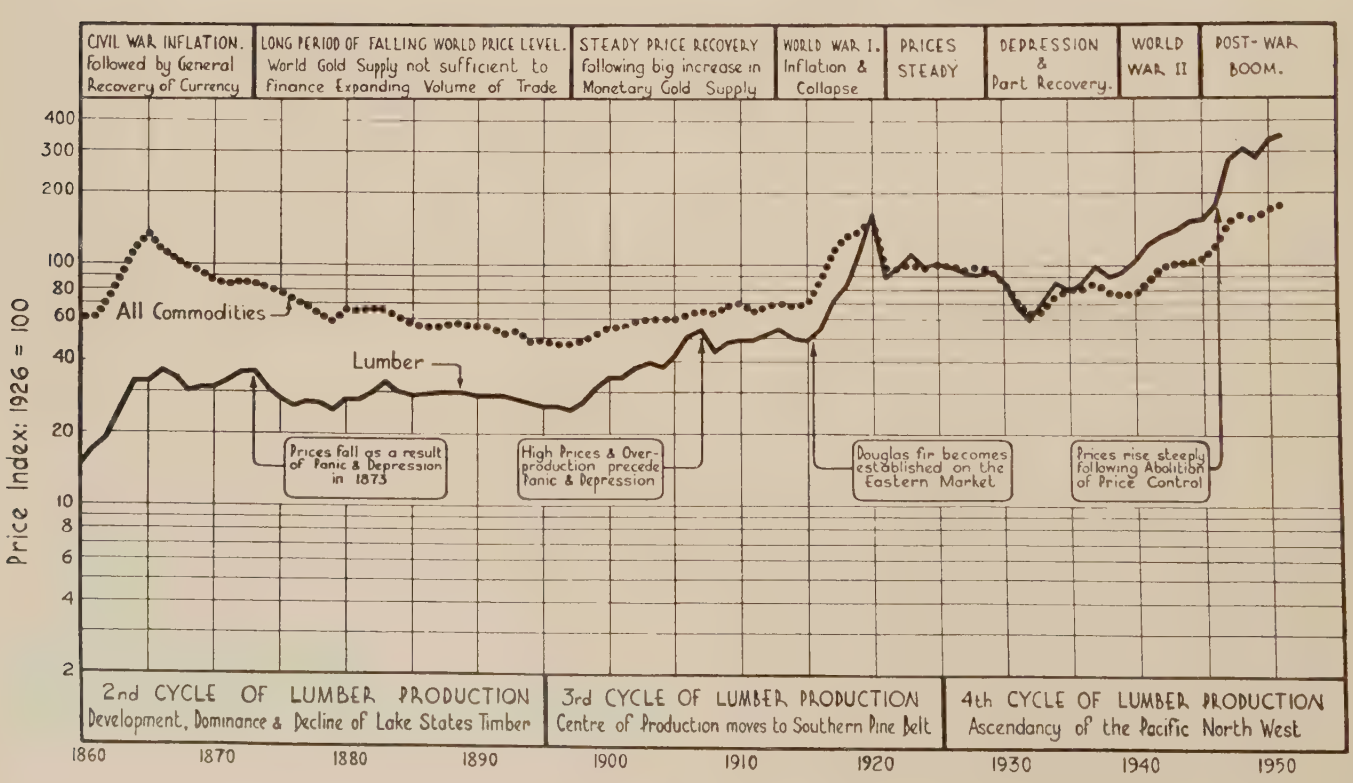
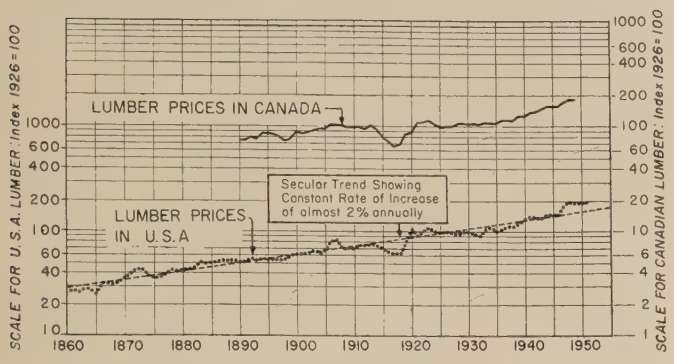


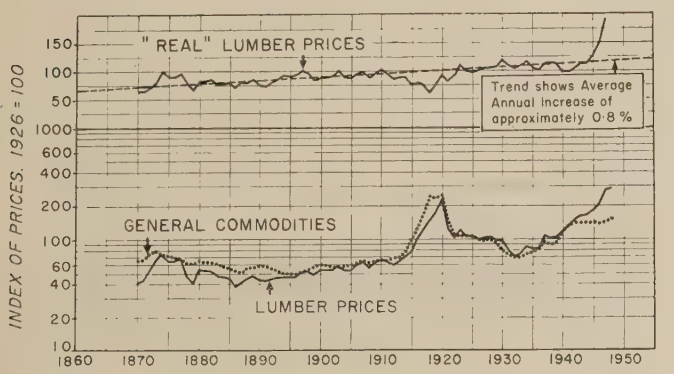
FIGURE 3. – *Lumber Prices in North America corrected for Fluctuations in Currency Values*


LUMBER PRICES IN CANADA
Secular Trend Showing Constant Rate of Increase of almost 2% annually
LUMBER PRICES IN U.S.A
SCALE FOR U.S.A. LUMBER: Index 1926=100
SCALE FOR CANADIAN LUMBER: Index 1926=100
1860 1870 1880 1890 1900 1910 1920 1930 1940 1950

An unpublished departmental report by the Forest Service Economist, Mr. M. B. Grainger, sustained these views as may be gathered from a study of Figures 2, 3 and 4, which are largely self-explanatory. As regards the basic data used for all three graphs, suffice it to say that in each case a relatively homogeneous series was available. It is largely because timber prices in North America have, on a constant currency value, moved upward with remarkably little fluctuation for nearly a century at a constant rate of almost 2 percent annually that New Zealand has committed itself to the growing of exotics for the export trade. Exhaustion of the Pacific Northwest resource is in sight, and there are few other high quality virgin softwood resources left. The trend is likely not only to continue but eventually to increase.

The New Zealand decision presupposes that the improvement in silviculture which has been effected on state forests and others during the latter years of the postwar period will be continued. There is a full realization that unless silviculture can finally result in a significant yield of clear and defect-rare grades, participation in world trade is likely to be extremely difficult and unremunerative. "Real" lumber prices in Sweden have increased annually at an average rate of 0.8 percent. Even though Scandinavian forests do not yield any significant proportion of defect-free or defect-rare grades, the timber is of extremely high quality in the medium grades, as compared with New Zealand rapidly grown exotic softwoods. More significantly, Scandinavia is very close to the world markets for such timber.

FIGURE 4. – *The Relative Movement of Prices in Sweden*

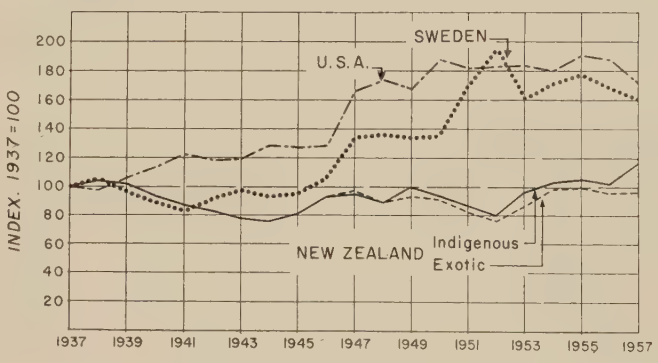

"REAL" LUMBER PRICES
Trend shows Average Annual Increase of approximately 0·8 %
GENERAL COMMODITIES
LUMBER PRICES
INDEX OF PRICES. 1926 = 100
1860 1870 1880 1890 1900 1910 1920 1930 1940 1950

Experience on the export market to Australia fully confirms these views. There is little doubt that with a significant proportion of clear and defect-rare grades the exotic export trade could be increased from the current level of 50 to 150 million board feet annually, even to the extent of completely eliminating Scandinavian competition. But it cannot be achieved except by a policy of intensive silviculture, to which the profession must address itself.

If, however, the world trend in timber prices provides a happy augury for those countries contemplating an expansion of their forest resources, whether for internal or external trade, it is necessary to ponder the realities of current social and economic developments.

Figure 5 is taken from another unpublished report (1959) by the Forest Service Economist, Mr. M. B. Grainger, on the short-term influence of timber prices

FIGURE 5. – *Timber Prices (constant money value)*



on the New Zealand forest economy. It compares the movement of sawn timber prices in New Zealand with those in the United States and Sweden from 1937 to 1957. As the common basis for comparison is in each case the level of wholesale prices in general (represented by the horizontal line 100) it can be seen that timber prices in the United States and Sweden have remained over the postwar period at anything from 40 to 90 percent above the general price level.

In contrast, the local price for the very high quality New Zealand indigenous timber in short supply has remained below the general price level for most of the period, and even now is less than 20 percent above, while that for the exotics still remains as it always has below the general price level. This is, of course, the effect of price control, and effectively demonstrates that however soundly based any forward long-term planning for forest development may be, it is subject short-term to the unforeseen exigencies of war and its resultant social and economic upheavals. The one consolation left to the forester is that all economic laws are inexorable and that inevitably time will remove the short-term frustrations and allow the fulfilment of long-term plans and eventual attainment of objectives.

It can be stated with confidence that lumber prices on a world-wide basis have been rising steadily in rela-

tion to the general price level for the greater part of a century. The trend moreover is so pronounced, and the exhaustion of virgin softwood forest areas now so well advanced, that this appreciation of real lumber prices is certain to continue well into the foreseeable future. Such a trend is fundamental to the future of forestry and silvicultural treatment of the forests. It shows that over long periods there need be no fear that the increasing amount of necessary silviculture will be frustrated because of economic considerations, and it will give assurance to foresters to plan and work to optimum effect.

There is, of course, a school of thought that by disintegrating wood chemically and mechanically for the production of particle or fibreboard in substitution for natural wood products the silvicultural problems of the forester could be simplified. There have even been claims that thereby the profession would be justified in following a concept of quantity rather than quality production, the principal manifestation of which is the cult of open or widely spaced planting.

It is the author's contention that only by following the concept of quality production can either quantity production be achieved or forest soils be put to the optimum use for the satisfaction of the diverse requirements of mankind. Even though the geneticists are finally able to produce disease-resistant stock to yield inherently good form trees, the fact remains that only by a relatively high initial stocking can the soil be put to early optimum use. As the stand progresses from stage to stage and as the site finds itself unable to sustain continued growth of all living stems, either deaths must occur or the weaker be removed by thinning. Followed to an (il)logical extreme the forester would finish up with the equivalent of Nature's prolific regeneration by either windthrow or fire, which are so commonly the origin of the high quality virgin softwood resources of the world.

Obviously density of stocking must be determined by the two factors of labor costs and utilization practices. Of all peoples in the world, it augurs most for those of the underdeveloped countries in which low labor costs can be perfectly integrated with the utilization of almost miniature sized stems for fuel wood. At the other end of the spectrum a still fairly high density of stocking will be justified because of the increasing possibility of integrating chemical utilization of thinnings with saw timber conversion for the final crop trees.

The strength of the pulp and paper industry in particular, and of disintegrated products in general, in the world forest products economy is largely due to the fact that a significantly large proportion of the raw material is secured as a low value residue from both forest and sawmilling operations which carry by far the greater part of the cost of both growing and conversion. Had chemical utilization to carry its full share of growing and conversion costs its competitive power in the world economy would be significantly lowered. Slowly but surely, however, it is being forced to make a greater contribution to both growing and converting costs. Concurrently the premium on high grade over low grade lumber is increasing, and as the high quality virgin softwood resources disappear so will this premium increase.

Because of the relatively low labor, power, plant and investment costs in sawn timber conversion and plywood manufacture, as compared with the relatively high corresponding costs for chemical utilization, the natural products will always remain strongly competitive with the chemical products, there being little doubt that combinations of the two classes of products may afford the most economical utilization of the raw forest material.

Against this background it is believed that silviculture must remain forever the principal tool of the forester in the economic use both of the forest soils and of their products.

(*Concluded from p. 173*)

tion, applications for financial support may be addressed to such philanthropic institutions.

It also seems possible that several of the large companies which are employing foresters in various parts of the world would be interested in awarding student fellowships both for training and research. Such companies — and there are many of them throughout the world — need men with a broad, international training. In addition, they may very clearly see the benefits of establishing research contacts and liaison with educational institutions.

It should be possible to create far more intimate co-operation between the forestry schools of the world than we have in 1960. We are not competitors. We have a tremendous task ahead of us — as we all know — when we consider the forest resources of the world, the conditions they are in, the manner in which we use them, and the immense need the world has for our forests.

Vegetative Propagation of Teak

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and

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Vegetative propagation is a most important implement in the hands of the forest tree breeder and the progress of his breeding is to a large extent dependent on whether he succeeds in finding a method which suits the species and the conditions he is concerned with. C. Syrach Larsen in Volume 5, Number 1 and lately François Mergen in Volume 13, Number 2 of *Unasylva* have stressed the importance of vegetative propagation for the work in forest tree breeding.

Teak (*Tectona grandis*) is of course no exception and in the spring of 1959 investigations were made in Thailand in order to find a suitable method of vegetative propagation for this species. The investigations were a result of a Thai-Danish botanical co-operation and were supported by the Danish Expedition Fund. If a practical method could be found, the intention was to establish a clone collection and thereby make way for breeding of teak on a larger scale.

Method

In the current investigations only the so-called *forkert budding* method was employed. This method is used extensively for budding of rubber (*Hevea brasiliensis*) and it was assumed that it might also suit teak.

Two vertical incisions forming a pointed arch are made on the rootstock. The rind flap thus made is lifted where the cuts meet, exposing the cambium of the stock (Figure 1). A budpatch, i.e., a rectangular piece of bark containing one bud from the selected tree, is placed on the exposed cambium and the flap pushed back. The union is covered with a rectangular piece of palm leaf which is tied firmly to the stock beginning from below and going upward. Finally, the budding is shaded with some large leaves fixed to the stock above the union.

The completed budding is left for a week or more depending on the species before opening takes place. After that time the budpatch and usually the flap have grown to the stock. At opening the rind flap is cut off exposing the budpatch. Some time after opening, when the callus has hardened and one is sure the budpatch is still alive, the stock is cut back.

The experiment

The actual budding took place at the end of April and the beginning of May 1959 at the Huey Tak teak plantation in northern Thailand. It was hoped that the budding could be carried out in the nursery, but due to low rainfall the previous year almost all the seedlings were too small for the purpose. A suitable area was then sought for in a 1958 planting also used for stocks of one-year-old seedling stumps (two years from seed and one year from planting in the field). The size of the stocks varied considerably, but the average diameter at budding height was about 3 centimeters. All the seedlings had developed new leaves at the time the budding began, which means that the resting period during the dry season was finished.

Budwood was cut from 11 selected trees, both in natural stands of mixed teak forest and from the plantation. The age of the selected trees ranged from 13 to 90 years. Each tree was budded on 15 to 25 stocks depending on the stocks available at the experimental site.

The timetable for the budding procedure was, briefly, as follows:

	Days
1. Insertion of budpatch — removal of cover and flap:	approx. 10
2. Removal of cover — cutting back of stock:	5-6
3. Cutting back — sprouting of budding:	4-8

Figure 1. *Insertion of budpatch on rootstock.*

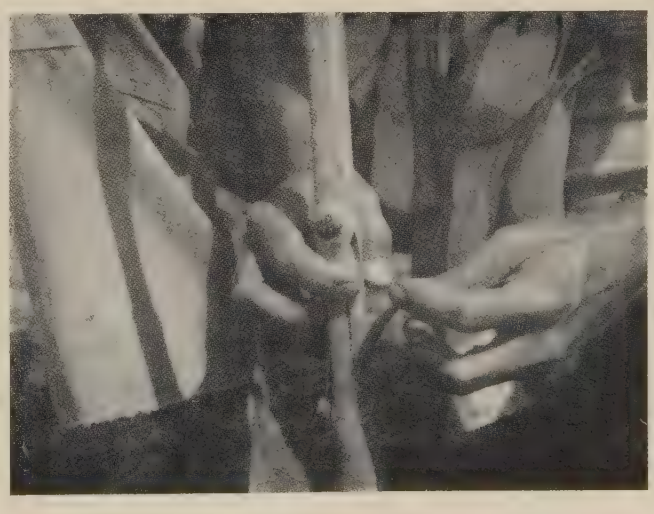


FIGURE 2. *Budding of teak on the point of sprouting.*

FIGURE 3. *Clone SG. V after one growth season, photographed February 1960. Note the union just over ground level on the first budgraft to the right.*

The total time between insertion of budpatch and the sprouting of the bud (Figure 2) is thus about three weeks, which is half the time for the same operation in rubber.

It soon became obvious that the callus formation on the stocks was very active. We found that a budpatch would grow to the stock after only four days from insertion. The result of the budding was most satisfactory. On an average, for 11 clones 80 percent of the buddings succeeded and began to sprout before the end of May. Some of the first buddings we made had grown 25 centimeters in three weeks from the time of sprouting. As a matter of fact, the shoots deriving from the inserted buds seem to behave in the same manner and grow with the same vigor as adventitious shoots from a stump.

Approximately 200 successful budgrafts were the result of these initial investigations. They have been followed closely during the first growth season and measured monthly, the last time in December when the rainy season stops. Three buddings had died due to termites, but the rest had reached an average height of 1.78 meters. Some clones measured 2.26 meters and were almost as high as the seedlings in the area surrounding the experimental plots (Figure 3).

It is possible that successful buddings may be increased to 90 or 95 percent, when some details have been improved and more experience gained. Even now it is thought safe to conclude, from these initial trials, that teak is easily propagated vegetatively. Teak compares favorably with rubber for which budding is used extensively not only in breeding but also in estate practice. Whether it will be feasible to do so for teak is an open question but, in any case, the 200 buddings comprising 11 clones form a clone collection or a tree show, from which useful information may be drawn to the profit of future silviculture of teak.

References

GRAM, K. and SYRACH LARSEN, C. The flowering of teak (*Tectona grandis*) in aspects of tree breeding. *The Natural History Bulletin of the Siam Society*, Vol. 19, Bangkok, 1958.

KEIDING, H. Budding and grafting of teak. *FAO/TSC-60/3.3.* New Delhi, 1960.

The Work of FAO

Latin American Forestry Commission

FAO's Latin American Forestry Commission held its seventh session in Mexico City, 3 to 6 August 1960. Delegations participated from Argentina, Brazil, Cuba, Dominican Republic, France, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Paraguay, Peru, United States, and Venezuela. The Holy See and the following international organizations sent observers: United Nations, International Labour Organisation, World Meteorological Organization, the Organization of American States, and the Inter-American Statistical Institute. The Director-General of FAO was represented by Sir Henry Beresford-Peirse, Deputy Director of the Forestry and Forest Products Division. Mr. Eero Kalkkinen, Regional Forestry Officer for Latin America, acted as Secretary of the session.

The Commission elected Enrique Beltrán (Mexico) as Chairman, and Elías Dabas (Argentina), Flavio Bazán (Peru) and Rafael Viloria Díaz (Venezuela) as first, second and third Vice-Chairmen, respectively. Juan Manuel González (Mexico) was appointed Rapporteur.

Trends in forest policy

The Commission's review of current trends concluded that:

1. Many of the countries in the region still depend heavily on imports to meet their needs for wood and wood products, but national forest policies are steadily being adapted to the requirements of domestic consumption and toward the reduction of imports.
2. Forestry is definitely being given greater emphasis in all the countries in the region in connection with land use programs, colonization and agrarian reform. Specific examples were cited from Argentina, Guatemala, Mexico, Paraguay, Peru and Puerto Rico. Especially in Cuba and Venezuela recent events have created completely new conditions with regard to the problems of land tenure, distribution and use.

The importance was emphasized of the establishment of machinery for economic integration and co-operation in Central America (CAIS) and in the countries of the Montevideo Treaty (ALALIC). FAO is already collaborating with the United Nations Economic Commission for Latin America (ECLA) in the study of matters affecting forestry, and the Commission requested that all possible information be furnished to national forest services and that, eventually, meetings of representatives of these services be convened in order to analyze the possible consequences for forest policies of the gradual application of such regional integration schemes. The Commission would welcome any action along the same lines taken by private associations of producers, industrialists and traders in the countries participating in these schemes.

The reason for the slow progress in building up administrative services for the development of forest resources, and institutions for forestry research and education, continued in part to lie in the lack of adequate guarantees of service stability for trained personnel. The Commission noted the progress of co-operation between FAO and the Inter-American Institute of Agricultural Sciences in the forestry education program offered at Turrialba, Costa Rica, and its possible expansion through the aid of the United Nations Special Fund for Economic Development. Other Special Fund projects in education and research were developing for Chile and Brazil.

The Commission asked FAO to prepare a regional training program for sawmill maintenance and logging operations with the International Labour Office (ILO), expressing its sincere appreciation to that body for its offer to extend its co-operation with FAO in this field to the Latin American countries.

Regional study of wood resources and requirements

A Secretariat spokesman reported on the present status of the FAO/ECLA study on trends in the production, consumption and trade of forest products in Latin America, which is expected to provide guidelines for long-term forest policies and add much to the knowledge of existing resources and their utilization. Discussing the general lack of data available on forest resources of the region, the Commission requested FAO to assign a high priority to the establishment of a regional center for training in aerial photogrammetry. The Mexican delegate offered the facilities of the Mexican Institute of Forest Research for such a center. (The first Special Fund forestry project to become operational in Latin America provides for a national forest inventory in Mexico, to be undertaken over the next four years.)

Other work of FAO in the region

The Commission fully supported FAO's program of work for Latin America which met current needs in the region. It referred its report to the Sixth Regional FAO Conference for Latin America (Mexico City, 8 to 20 August 1960), for endorsement. Many of the delegates proceeded on from the session to join the Fifth World Forestry Congress in the United States. On their return, a number joined the tour which FAO organized with the Government of Mexico in September-October, for foresters to study the extensive range of conifers

growing in that country and which have been widely introduced into other regions for planting programs. The Mexican tour was followed by short visits in British Honduras and Cuba.

Topical Notes

FAO Freedom from Hunger Campaign

The FAO Freedom from Hunger Compaign was officially launched on 1 July 1960 at a ceremony in Rome distinguished by messages of support from the presidents of the United States of America, France, India, Germany and Yugoslavia, from the Queen of the Netherlands, from the Prime Ministers of the United Kingdom, Ireland and New Zealand, and from His Holiness the Pope.

Mr. B.R. Sen, Director-General of FAO, said the response to the campaign was symptomatic of the interest of peoples all over the world in a rededication of the aims and objectives of FAO. The problem with which it is trying to deal is that more than one half the world's population do not have enough food or the right sort of food. "They are caught in a vicious circle of stagnation, apathy and poverty. At the same time, population is increasing at a faster rate than ever before, particularly in those same regions which are deficient in food supply." The crux of the matter, however, "is not overpopulation but underproduction." The campaign was designed to recognize this threat. Hunger is neither inevitable nor irremediable and it is within man's power to bring this old affliction under control.

Since each individual country has its special problems, the components of an action program will vary widely among different countries. Examples of projects where forestry and forest products can help are: restoring overgrazed soils, community forests, growing more food with shelterbelt protection, range reserves for drought years, more fuelwood for cooking and heating, better packaging, farm woodlands adding to farm incomes, improved low-cost housing.

FAO Council

Under the presidence of Louis Maire of Switzerland, Independent Chairman, the FAO Council held its thirty-fourth session in Rome, 17-27 October 1960. Since the Tenth Session of the FAO Conference in 1959, four countries newly independent have joined the Organization as full members: Cameroun, Cyprus, Nigeria and Togo. FAO's membership now stands at 81 countries, with seven associate members.

Addressing the Council, the Director-General remarked: "I venture to say that seldom before in the history of FAO have we been called upon to undertake such an expanding variety and volume of activities.

"In the first five years of its existence, FAO's functions were confined to activities carried out under the Regular Program of Work and Budget fixed at a level of $5 million per annum. The year 1950 saw the beginning of the Expanded Technical Assistance Program, which has grown to about $8 million per annum. In addition, countries have increasingly turned to FAO for assistance at their own expense under trust funds, which will amount to nearly a million dollars in 1960.

"The biggest and most recent of the additions to our program comes from the establishment of the United Nations Special Fund for Economic Development. FAO's responsibilities include planning, evaluation and execution of projects. The Special Fund budget is on the increase and FAO, judging by the realities of the situation, can well expect to continue to participate in the operations of the Fund on the present proportionate scale. This would mean FAO staff taking responsibility for planning and evaluation of over $17 million worth of projects every year and executing, by the beginning of 1962, projects totalling over $12 million and, by the end of 1963, well over $20 million. Recent discussions have indicated that FAO may also be asked to play a part in the effective realization of funds available to a number of other international organizations which have just been or are about to be established."

These new and additional responsibilities, added to emergency programs arising from the Chilean earthquake disasters of May, the Congo troubles and the rapid evolution which is generally taking place in Africa, are placing a heavy strain upon the staff of the Organization, said Dr. Sen. New staff have to be recruited and the combination of technical qualifications and languages is not always easy to locate.

"The question may be asked whether it is necessary that all these new forms of activity should be assumed by FAO. The answer in my view is emphatically 'yes.' These activities are essentially of an operational character; they bring us into closer touch with the process of accelerating agricultural and economic development which is a basic responsibility under our Constitution. They make this Organization more than ever a live and dynamic body, and provide close participation in national development programs. However, these responsibilities must be additional to, and not in substitution of, our Regular Program.

"My 1962-63 budget proposals will take account of these developments. I have given careful thought to all the issues involved, and have come to the conclusion that a total increase in the contribution of governments will be needed in the order of $ 5,700,000 for the biennium.

"For a Budget for 1962-63 at this level, I do not feel, Mr. Chairman, that I need make any apology. The world as a whole today is on the march. A large part of the developing regions of the world is predominantly agricultural. The Organization established by the United Nations and charged with providing international leadership in this field is FAO. The Preamble to the FAO Constitution makes that clear. Any dynamic policy on the part of the United Nations to assist the economic development of the underdeveloped countries must, therefore, be adequately reflected in the Program and Budget of FAO."

Mediterranean Forestry Subcommission

It has not been possible to report earlier on the seventh session of the Mediterranean Forestry Subcommission held in Lisbon, 2-7 May 1960. The meeting was attended by 53 delegates representing nine countries, and was presided over by P.M. Hermosilla (Spain), with J. Vieira Natividade (Portugal) and M. Badra (Tunisia) as Vice-Chairmen. L. Gimenez-Quintana (FAO) acted as Secretary, Egon Glesinger represented the Director-General of FAO and Sir Henry Beresford-Peirse was present for FAO's Forestry and Forest Products Division.

The Subcommission concentrated mainly on follow-up action on the FAO Mediterranean Development Project, and the most important recommendations were:

1. national forest services to nominate permanent liaison officers to FAO for the implementation of the project;
2. the establishment of a Mediterranean seed bank for the collection, storage and distribution of indigenous and exotic tree seeds;
3. expert consultation to investigate the possibilities for a regional plan for the establishment of industries, mainly pulp and paper;
4. the regional co-ordination and programing of forest research, to be carried out co-operatively by the research stations in the region;
5. the establishment in the region of a faculty of land use to train technicians to serve in any country of the region;
6. creation of a Mediterranean forest fund (on the lines of the similar French fund) to finance long-term investments in forestry;
7. managers of integrated development projects in the region to meet from time to time for the exchange of technical experience; to arrange, if feasible, exchange of experts and equipment; and to consult on phasing of development programs and location of new "spearhead development zones."

Other subjects dealt with in detail were range management (forest grazing) and the resin industry. The working parties on cork oak and on eucalypts held separate meetings.

J. de Vaissière (France) was elected the new Chairman of *Silva Mediterranea*, a position filled for ten years, it will be recalled, by a figure held in the highest esteem and much beloved, the late Professor Aldo Pavari of Italy.

FAO research fellowships

The research fellowships instituted by the FAO Conference in honor of Professor André Mayer of France, a renowned scientist who died in 1956 and who had been one of the moving spirits in the formation of the Organization, are aimed at promoting and encouraging scientific research having a connection with FAO's program of work, and are awarded annually to selected researchers. They enable the recipient to work for one to two years at an institute in any FAO member country, either to carry out independent research work or to receive training in advanced research methods.

Awards approved for 1960 include one to George N. Baur, Australia (ecology as a basis for rain forest management). Earlier awards in forest research have been made to: Sumihiko Asakawa (Japan), P.J. Viro (Finland), Sorayut Karatna (Thailand), A. Nyassonen (Finland), and G. von Malmborg (Sweden).

Training course in aerial forest inventory

A report will appear in the next issue of *Unasylva* on the first international training course in aerial forest inventory which took place from August to October in Malaya and North Borneo. Organized by FAO in co-operation with the governments of the countries concerned and with the support of other organizations, including the Colombo Plan, students attended from the Philippines, Burma, Thailand, Japan, Indonesia, Malaya and Korea. Director of the center was Professor Fritz Loetsch, on leave of absence from the Federal Forestry and Forest Products Institute, Germany.

The first two months of the course were spent at Kuala Lumpur, Malaya, with a field trip to a mangrove forest area. The final month was spent in North Borneo and entirely devoted to field trips. Instruction dealt with aerial photographs and surveying; photo interpretation; sampling methods in combination with interpretation of aerial photographs; combination of aerial and ground forest survey; inventory methods used in various tropical countries; and possibilities of using aerial photographs for forest management plans and national forest surveys.

International Union for the Conservation of Nature and Natural Resources

The utilization of the "wildlands" marginal to agriculture and sometimes also to forestry, which constitute an appreciable part of the world's — and Africa's — land surface, is a problem the importance of which is gaining considerable recognition today. The recent inclusion of wildlife management among the activities for which FAO accepts responsibility is evidence of this growing concern.

In the light of the important program being carried out by the International Union for the Conservation of Nature and Natural Resources (IUCN) in this field, and at the request of its Executive Board, FAO has agreed to the temporary secondment of Gerald Watterson, of its African Office, to IUCN as its new Secretary-General. He will relinquish his post of Regional Forestry Officer for Africa early next year.

Apart from establishing IUCN's new headquarters in Switzerland, one of his first tasks will be to organize

and lead a small group of qualified Africans to discuss the principles and practices of conservation with leaders of African opinion. This mission is one of the steps in preparation for the proposed CCTA/IUCN Wildlife Management Conference scheduled for the latter half of 1961 in East Africa.

Near East Forest Rangers' School

There has not been opportunity earlier to report the formal opening of the Near East Forest Rangers' School at Latakia, United Arab Republic, which took place in February 1960.

The opening ceremony started with speeches, followed by a tree-planting ceremony when a new avenue was planted in front of the school buildings. The Minister of Agriculture for the Syrian region then cut the band at the main entrance to the school and unveiled a commemorative marble plaque at the main gate. After the school buildings had been inspected, there was a showing of forestry films, and later a formal banquet.

For this FAO project, the United Arab Republic has provided the land, buildings and many other facilities. FAO has contributed equipment and an Acting Director, Dr. O.A. Badran. The school is intended to train men from the Arabic-speaking countries of the region to fill the gap that exists between university-trained forestry officers and forest guards. The course of studies will extend over two years. The first group of students is drawn from Iraq, Jordan, Sudan and the United Arab Republic.

Oxford System of Decimal Classification for Forestry

The Joint FAO/IUFRO Committee on Bibliography at its Eleventh Session in Madrid in September 1959 examined and discussed some further proposals for amendments to the Oxford System of Decimal Classification for Forestry. As a result, notification is made of the following decisions taken in conformity with the method of procedure for the development of amendments to the Oxford System of Decimal Classification for Forestry *

Amendment No. 3, as authorized by the Joint FAO/IUFRO Committee on Bibliography (Madrid, September 1959).

At 0, *p. 12,*	*in square-bracketed comment under main title add*
	; for *general* monographs of individual species or other taxonomic groups see comment at 17
At 14	*in square-bracketed comment add*
	See also comment at 17
At 17	*in square-bracketed comment, add a third and fourth paragraph as follows*
	The numbers that follow, with their further subdivisions (alphabetical or numerical) can serve, by using cross-references, as an index to *any other* information on the plants concerned, as well as pure taxonomy. The procedure is explained by examples in section (3) of the Introduction. Two further examples:
	(*a*) General monographs on individual taxonomic units (chiefly species) may be referenced as 0 : 17..., or 0—17..., or 17... —0;
	(*b*) their general silviculture is treated similarly as 2 : 17..., or 2—17..., or 17... —2. If only one card can be allowed, the third method has the advantage of collecting all the information on e. g., a species in a single place in the catalogue – viz. at 17... —.
	If desired, the same procedure may be used for animals, under 14.
At 233	*in square-bracketed comment read*
	[Cross-reference, as appropriate, to subdivisions of 114.4, 116, or 187. For afforestation policy see 913/914]
At 322.3	*add,* " chemical barking "
At 411	*add subdivisions as follows*
	411.1 Natural enemies concerned in contro
	411.11 Lower invertebrates
	411.12 Insects and other arthropods
	411.13 Amphibia and reptiles
	411.14 Birds
	411.15 Mammals
	411.16 Bacteria and fungi
	411.18 Virus diseases
	411.19 Miscellaneous
At 62	*insert after* WORKING PLANS *in round brackets*
	(SHORT- AND LONG-TERM).
At 811.7	*insert after* bark *in round brackets*
	(including also gross morphology)
At 928	*read*
	Fragmentation and consolidation of holdings

* See *Unasylva*, Vol. 11, No. 3 and Vol. 13, No. 2.

Equipment Section

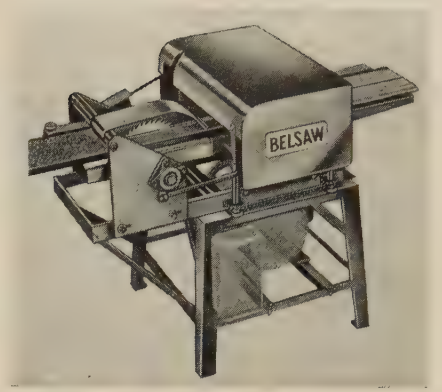
Circular Saw Guard. — Guard accommodates workpieces of various thicknesses without preadjustment. It comprises three pairs of overlapping disks enclosed in semicircular housing over the saw blade.

Normally the leading and trailing disks rest on saw bed as shown, but when workpiece is fed toward saws the disks are in turn raised upward by the workpiece and ride on the upper surface to give complete side coverage of the saw. When the workpiece has passed through, the disks drop back, pair by pair, into their original position.

Associated Electrical Industries Limited, Switchgear Division, Neasden Lane, Willesden, London N.W.10, England.

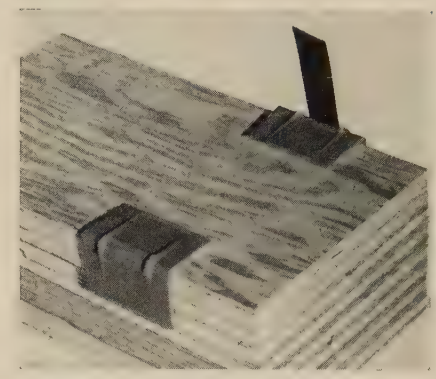
Belsaw Multi-Duty Power Tool. — This tool saws up to 2 ¼ in. (5.71 cm.) thick; planes up to 12 ¼ in. (31 cm.) wide, up to 6 in. (15.24 cm.) thick; molds face or edge up to 6 in. (15 cm.) wide. Power feeds 12 to 22 ft. (3.66 m. to 6.70 m.) per min. For high speed commercial output 3 to 5 hp motor should be used.

Belsaw Machinery Co., 315 Westport Road, Kansas City 11, Missouri, U.S.A.



Colored Corners. — For use with steel strapping to protect the edges of product in shipping. The lightweight durable plastic edges exist in various colors; they protect product from rust and stain, make handling safer.

Oregon Industrial Factors, 6840 S.W. Macadam Avenue, Portland 19, Oregon, U.S.A.



Potts Mist Blower. — Enables the forester to thin economically, favoring one species over another, with selecting chemicals. Compact unit includes gasoline motor, fan, housing, pump, pressure gauge and 25 gal. (95 l.) tank with recirculating agitation. Fan housing can be rotated in a 200° arc or set to deliver to any angle or direction. Fan delivers 2,000 cu.ft. (56 m^3) of air per min. at speeds up to 190 miles (300 km.) per hour. Accessories: auxiliary tanks, tank brackets, pump fittings, oil resistant hoses; protective shield and connections provided.

Potts Mist Blower, Box 51, Crawford, Mississippi, U.S.A.

Fork Truck Model TC. — Tipping fork and claw attachment fitted to fork truck facilitates handling of loose lengths of materials, pit props, rough sawn timber, railway sleepers, etc. Attachment used instead of normal fork can be raised or lowered within the limits of the mast extension and is operated by the truck hydraulic system. Forks can be tilted up to 15° above the horizontal and 33° below it. *Specifications*: (T.C. yard model) 2,800 lb. (1,270 kg.) at 21 in. (53 cm.) from heel of forks; height 62 in. (157 cm.); width 55 in. (140 cm.); fork length 42 in. (106 cm.); fork width 4 ½ in. (11 cm.).

Conveyancer Fork Trucks Ltd., Liverpool Road, Warrington, England.

File for Saws with Tempered Teeth. — The tops of saw teeth are tempered more than the blade and proper filing is impossible. This apparatus does not contain a file but a special stone. Saw is filed by passing apparatus from one end to the other along blade as shown.

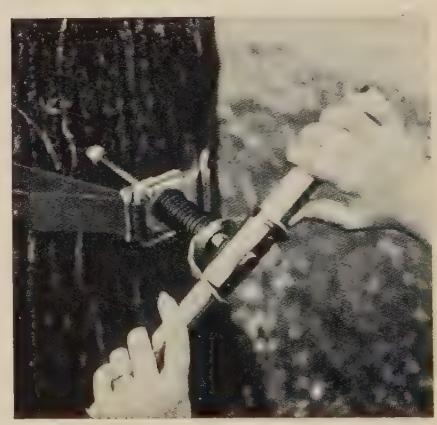
August Krumm, Johann Krumm Sohn, Remscheid, W. Germany.

Hand Brushcutter. — Principle of operation is based on a lever system. Once the stem is gripped in the jaw, it is sufficient to move handle backward to pull the shrub up by the roots. Tool should be used in the winter or during the rainy season, as moist soil facilitates uprooting.

Etablissements "Le Débroussailleur," Reilhaguet (Lot), France.

Jet Wire Roller — Can be mounted on any tractor with standard p.t.o. Only two setscrews and one bolt necessary to tighten. Clutch tension on wire possible at all times whether rolling or un rolling. Capacity 100 rods (500 m.) double strand barb wire in 3 minutes.

Jet Company, Gilmore City, Iowa, U.S.A.



Increment Borer Bit Starter. — Consists of simple hollow feed screw with a new type quick release buckle and a yoke into which the borer handle is fitted. In operation, a belt is placed around the tree and fastened on to the side of the starter. Controlled tension on this belt keeps the borer snug against the tree while the assembly is rotated. Can be separated even by an untrained person. Weighs less than 1 lb. (453 g.).

Forestry Suppliers, Inc., Jackson, Mississippi, U.S.A.

News of the World

Czechoslovakia

• The Czechoslovak Dendrology Section, which was founded two years ago, is aiming to found an international confederation of dendrology organizations in view of the need to solve many problems which either go beyond the bounds of one single state or are connected with studies in other countries. A first step was a meeting of Polish and Czechoslovak dendrologists which took place in June 1960 in the Arboretum Mlyňany of the Slovak Academy of Science, in which 131 dendrologists participated, 41 from Poland, three from Eastern Germany, a representative of the Hungarian Botanic Section, and 86 from Czechoslovakia. The meeting was devoted to presentation of technical papers, especially on *Castanea sativa*, combined with field trips. A committee was set up to continue negotiations to found the confederation, and another session is planned to be held in three years time.

Finland

• A comprehensive history is being published in connection with the centenary of the Forest Service, but in the meantime the State Board of Forestry has issued a very attractively presented brochure on the tasks and activities of the Forest Service.

It is the task of the State Board of Forestry to manage, supervise and promote Finnish forestry. Its activity is thus not limited to caring for the forest properties of the State. State forest administration naturally aims at increasing the profitability of forest properties and includes all the measures necessary to attain the objective, thus gradually transforming the Forest Service into a large employer and business enterprise. On the other hand, the general interests of the country's forestry and especially supervising the promotion of private forestry have steadily added administrative tasks of a general nature to the duties of the Board. The Board also carries out various other tasks ascribed to it by law.

This dual role of the forest administration is clearly illustrated by its organizational structure. The Finnish State Board of Forestry, a central agency acting under the supervision of the Ministry of Agriculture, is divided into two divisions: that for state forests and that for private forests, both under the same director-general and a deputy director-general. The divisions also have common secretarial, accounting and statistical offices.

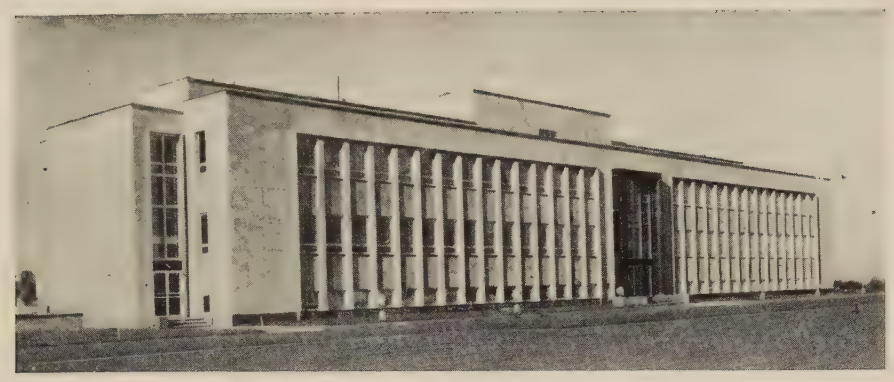
France

• *La forêt privée*, a Franco-Belgian periodical published from Paris (61, avenue de la Grande-Armée, Paris 16e), aims at providing a medium for the interchange of technical information between private forest owners, and its policy is to defend their interests and to foster trade between the countries belonging to the European Economic Community. Besides its circulation in Europe, the review has also a limited distribution in Quebec Province, Canada.

India

• Systematic scientific management of India's forests began in the year 1861. The government of India, with the co-operation of state forest departments, proposes to celebrate the centenary of forest administration in India during 1961 in a fitting manner. At that time, two volumes of centenary publications will be issued, describing India's forests in all their aspects. It is proposed that articles of general interest on forestry, from eminent foresters in India and abroad, should form part of the centenary publications. The President, Forest Research Institute and Colleges, Dehra Dun, will gratefully acknowledge contributions for the above publications.

CAMEROUN: *Villagers are supplementing traditional terracing for millet cultivation by the construction of check-dams in erosion gullies and the protection and revegetation of rocky hillsides. Community woodlots, mainly of* Cassia siamea, *are becoming increasingly and voluntarily established as sources of fuel and poles.*



CANADA: *The new federal forest research laboratory at Quebec, which was opened earlier in 1960.*

Kuwait

The Public Works Department of Kuwait has started a tree-planting program within and outside town limits. Considering the difficult climatic conditions of the country, this is a remarkable development. During the summer the temperature rises to 63° C. in the sun and 38° C. in the shade. There are short spells of high humidity. The minimum temperature in winter is around 5° C. The annual rainfall is 6 to 8 inches (150-200 millimeters) and it occurs during the winter months.

The soil of Kuwait is, in general, sandy sand saline in nature. It is silty and 1 foot (30 centimeters) down from the surface, sand with broken gatch from 1 to 3 feet (30 to 90 centimeters) deep, and hard gatch below. The gatch layer is impermeable to water and it varies in thickness and depth at different sites.

The water used for irrigation is brackish and contains from 3,000 to 4,000 parts per million of dissolved salts.

Planting holes are 1 cubic meter in size. They are filled with sweet soil and about 2 to 4 kilograms of farmyard manure. Among the species tried with some success are *Prosopis juliflora, Parkinsonia aculeata, Eucalyptus occidentalis, Casuarina glauca, Albyzia lebbek,* and several *Acacias.*

New Zealand

• According to an official report to FAO, New Zealand is now by far the world's largest producer per head of population of preservatized timber for building purposes. Species of timber available, traditional methods of house construction, and developments in preservation techniques are the main reasons for this. The increased use of exotic softwoods, which are just as liable to decay and no less susceptible to insect attack than indigenous timbers, and the difficulty of ensuring throughout the life of a building that moisture cannot enter any part, demand the wide use of preservatized timber. Much controversy has naturally arisen regarding the effectiveness of various types of treatment and the extent to which treated timber should be used in a building.

In September 1955, the government, in order to resolve these questions, set up the Timber Preservation Authority. The principal function of the Authority is to secure and maintain a high standard of timber preservation. All treatments carried out must be in accordance with the requirements of the Authority, which has established an inspecting organization under the New Zealand Forest Service. The Authority has adjudicated on and approved a number of specifics and methods which were previously the subject of controversy. Notably the application of boron compounds by diffusion has been accepted for all timbers requiring treatment for light building construction other than those for use in contact with the ground. The regulations under which the Authority functions permit it to prescribe that no preservative-treated timber can be marketed unless the treatment and the marking of the timber agrees with the Authority's requirements. Progress in preservation practice and use of treated timber will now be quickened. Latest figures show that 144 million board feet of timber (23 percent of total timber production) were treated by diffusion and pressure impregnation in 1959.

Treatment of natural rounds from exotic forest thinnings is now fully equal to the demand. This treatment enables this otherwise low utility produce to be used for farm and engineering requirements where durability in the ground is important.

Poland

• Foresters are not able to manage the national forest domain properly unless supported by enlightened public opinion. That is why so much attention is paid in many countries to public information campaigns and school education programs. A book, *Treasures of the forests* (*Skarby Lesnych Ostepow,* by Professor Wieslaw Grochowski, Warsaw, 1959) has been published to show in an arresting way the variety of products deriving from the forests of Poland and the possibilities for their present and future utilization.

Profusely illustrated, and published under the auspices of the National Council for the Protection of Nature, the book has been recommended by the Ministry of Education for use in high schools.

Sudan

• The Forest Department carried out radio and cinema programs to celebrate the Fifth World Forestry Congress. Talks were given by the Minister of Agriculture, the Head of the United Nations Mission in the Sudan, the FAO Country Represent-

NETHERLANDS: *In June 1960 a "Forest and Wood Days" festival was held for the first time in the Netherlands, organized by the Netherlands Wood Society, the forestry organization Bosschap, and the foundation for practical training in forestry. The aim was to promote interest in forestry and the timber trade. The festival extended over three days. Modern machines and implements were demonstrated in operation.*

Courtesy: Ned. Heidemij, Arnhem

ative and forestry experts, and the Director of Forests, and these talks were also published in newspapers.

An informative leaflet about the Congress was printed and distributed to the public. Six forestry films were shown in different parts of Khartoum and Omdurman on the day the Congress opened. In addition a continuous stream of releases and news was kept flowing by radio and newspapers, before and after the meeting of the Congress.

Also in honor of the Fifth World Forestry Congress the Sudan issued a new set of postage stamps, which have been much in demand. The stamp design shows, on the right, a tebeldi (*Adansonia digitate*), a well-known indigenous tree growing wild in central Sudan. Its chief feature is the great diameter of the trunk which is hollowed out and used for storing rain water. This water is often the only source of drinking water for cultivators and gum pickers during the harvest season. It has an edible fruit of a sweet acidic taste. It is feared that its natural regeneration is insufficient to maintain its present numbers. On the left is a grove of another well-known Sudan species, the deleib (*Borassus aethiopum*). This is a beautiful erect tall palm much liked for its fruit and timber. It is gregarious and grows wild in central and southern Sudan.

United Kingdom

• *Code of sample plot procedure* (F.C. Hummel, G.M.L. Locke, J.M.R. Jeffers, J.M. Christie, Forestry Commission Bulletin No. 31, 1959) codifies the instructions for carrying out measurements and observations on experimental sample plots of the Forestry Commission. The bulletin is both highly condensed and very complete and will be of value to foresters throughout the world interested in forest research and in growth studies of forest stands.

• The International Union of Forest Research Organizations (IUFRO) has published a remarkable work in English by J.N.R. Jeffers, *Experimental design and analysis in forest research* (Almqvist and Wiksell, Stockholm, 1960).

The writer is well known for his work at the Alice Holt Research Station in England and his book is just what is needed not only for research workers but for general foresters also, providing a sort of simple recipe volume, easy to read but founded on solid experience. For the amateur statistician, it opens new horizons. It is to be hoped that the book will be translated into other languages.

United States of America

• The Tenth Pacific Science Congress of the Pacific Science Association will be held at the University of Hawaii, Honolulu, from 21 August to 6 September 1961. The Pacific Science Association is an international, regional, nongovernmental scientific organization, founded in 1920 by the Pan-Pacific Scientific Conference in Honolulu. Each congress is held under the auspices of the organization which represents the Association in the host country. Previous congresses have taken place in Australia, Japan, Indonesia, Canada, California, New Zealand, Philippines and Thailand. The forestry section of the Association has divisions of forest biology, management and forest products.

• From Hardy L. Shirley, Dean of the Syracuse College of Forestry, it is learned that an assistance contract now links together the College of Forestry of the University of the Philippines and the New York State University College of Forestry.

Sponsored and supported by the Philippine Republic and the International Co-operation Administration, the technical assistance agency of the United States government, the program provides for eight professional foresters from the United States to go to the Philippines and, at the same time, 15 young faculty members of the University of the Philippines to visit the United States to familiarize themselves with American forestry techniques and methods.

• Nearly 4 million acres of public lands, mostly in the Great Plains states, have been renamed National Grasslands by the Department of Agriculture and placed under the permanent jurisdiction of the Forest Service. The step is regarded as a move to nail down the continuing effort to promote the economic stability of Great Plains agriculture. When these lands became dust bowls they were taken over by the federal government during the depression, and were managed by the Soil Conservation Service from 1938 through 1953. Under the Forest Service they will be managed under multiple use and sustained yield management plans, with the emphasis on grass production. States in which lands are situated include North and South Dakota, Colorado, Kansas, Nebraska, Wyoming, Oklahoma, New Mexico, Idaho and Oregon.

• The Smithsonian Institution has been asked to consider reprinting Standley's *Trees and shrubs of Mexico* (Contr. U.S. Nat. Herb., vol. 23, pts. 1-5, pp. 1-1721, 1920-1926), which has been out of print for years. The Institution would welcome expressions of interest in such a reprint, the cost of which would be approximately $20. Address inquiries to Editorial and Publications Division, Smithsonian Institution, Washington 25, D.C.

Union of Soviet Socialist Republics

• An article in *Lesnaia Promyshlennost* reports on the use of helicopters in logging. Trials, comprising 66 flights (with load) and 18 variants (distance, load, etc.), were made at two sites in the Caucasus in oak and beech/fir forests, at 800 to 1,100 meters. Assortments, tree-length logs, and whole trees were transported for various distances up to 22 kilometers. The helicopter, a standard MI-4, was able to transport from clear fellings and group-selection fellings, but clearings 50 by 50 meters had to be made for it in selection forests proper.

From the economic standpoint, it seemed desirable to transport assortments only. A single trial was made of attaching cables to the tree before felling, and lifting the whole tree up and away before it could fall to the ground. This procedure was found lengthy and dangerous and is definitely not to be recommended. Analyses showed that costs of transporting timber by helicopter at present are 2 to 6 times those of conventional ground extraction methods.

It is thought that helicopters will be effective for extracting relatively small volumes from specific areas in mountainous regions where roads are very expensive to build. For work in forestry, helicopters should be able to take loads of 8 to 10 tons, and are best for transport distances of 3 to 8 kilometers.

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WORLD DEMAND FOR PAPER TO 1975

A Study of Regional Trends

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